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ABSTRACT

A workshop/conference held in Boulder, Colorado, during two weeks of summer 1972 had the goal of bringing together a group of university researchers and planning practitioners to "think through" how the research requirements of environmental/land-use planning might be met and to identify the areas of new knowledge needed by practitioners and society at large if they are to do a better job of planning the physical environment. The conference encompassed two elements: (1) the substantive questions dealing directly with the problems involved in planning physical environments (within a broad societal framework) and (2) research organization--what needs to be done to insure that the necessary research is carried out. The book is divided into four parts. Part 1 presents the recommendations of high-priority research for land-use planning and allocation that were developed by the workshop participants. Part 2 contains an introductory chapter and an historical overview of land-use planning in the United States. Part 3 comprises a collection of nine background papers devoted to various topics concerning the social, economic, and natural environmental factors important to environmental/land-use planning. Part 4 contains six committee reports that were prepared during the conference. (Author/MLF)

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Environment: a New Focus for Land-use Planning

Edited by
Donald M. Mc Allister

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FOREWORD

The way in which our physical environment—and particularly the land—is planned (or is not planned) greatly influences the quality of the environment and, indeed, the quality of our lives. Yet the practitioners who are responsible for environmental/land-use planning must function within jurisdictional boundary lines that make no environmental sense. They must also face intense conflicts of values among their "client" groups with regard to land uses, and try to find here-and-now local solutions that are reasonably compatible with the powerful national forces (technological, social, economic, and political) that are sweeping over the land. To cope with such overwhelming problems in a rapidly shifting scene clearly requires a substantial knowledge base and strong analytical tools, yet today the planning practitioner is receiving only minimal research assistance from the established research institutions.

Neither the difficulties and problems, nor the less-than-adequate planning end product, have gone unnoticed. Increasingly, at every level of government there is a search for effective means for the rational development of the physical environment. Congress has shown intense interest in land policy and it seems likely that substantial Federal legislation concerned with land-use planning will be developed in the near future. The planning of land and related resources is also receiving increased attention at the State, regional, and local level as well as from citizen and public interest groups. Clearly, both legislation and implementation will gain if based on sound research, devoted specifically to the most pressing environmental/land-use planning problems and potentialities.

It is against this background that the Environmental Systems and Resources Division of the National Science Foundation's RANN (Research Applied to National Needs) suggested bringing together a group of university researchers and planning practitioners to "think through" how the research requirements of environmental/land-use planning might be met, and to identify the areas of new knowledge needed by practitioners and society at large to do a better job of planning our physical environment.

Given the far-reaching importance of anticipated legislation, a careful review of what was needed seemed necessary. Here was an opportunity to promote research in anticipation of a new national effort, rather than after the "bugs" began to appear.

The first step was a 2-day meeting of a Steering Committee, made up of scholars and practitioners, to determine how this task should be carried out. It was decided that an intense medium-length workshop/conference with practical-minded university researchers and research-wise planning practitioners would probably be most fruitful to pin down such a complex and elusive subject. The choice of participants with a mixed background of research and practice would (hopefully) minimize communications problems. The workshop/conference was held during 2 weeks of the summer of 1972 in Boulder, Colo. Over 40 participants were involved, about equally divided between university people and practitioners.

From the beginning, the enterprise encompassed two elements: (1) the substantive questions; that is, those dealing directly with the problems involved in planning our physical environments (within a broad societal framework); and (2) research organization—what needs to be done to insure that the necessary research is carried out. Research priorities were seen as the link between the two environmental/land-use elements; in the first case, as the product of considerations of the substantive problems; in the second, as recommendations to the National Science Foundation.

It was evident that even an unusually knowledgeable group of participants could not really come to grips with a subject of such immensity without substantial preparation. For this reason, a series of background papers was solicited long before the workshop. These papers covered many of the key subjects with which we hoped to deal, subjects within the social, economic, institutional, and natural environment realms. In each case, the author was asked to provide an overview of what was known in the particular field that was pertinent to the problems with which land-use practitioners had to cope. As anticipated, the experts who were asked to prepare papers in the various fields produced an extremely valuable series of state-of-the-art summaries. These papers are reproduced in the present volume. We anticipate that they will be of interest to scholars and practitioners concerned with environmental issues.

The background papers provided a sturdy foundation for the discussions carried out by the conferees. The greatest part of these discussions were centered in six working committees which, in turn, produced a series of reports outlining needed research. These committee reports covered the topics of "Environmental Sciences," "Settlement Patterns," "Environmental Assessment," "Data," "Institutions," and "Organization for Research"—the last of these cutting across all the substantive topics.

To provide background materials for the anticipated discussion of "Organization for Research," I asked two graduate students in urban planning, Isabel Reiff and David Dubbink, within the UCLA Secretariat (which had been set up to "service" the whole effort), to carry out a survey of practitioner and university-researcher views on the subject, and particularly what were seen as blocks to more effective university research contributions to environmental planning practice. Instead of merely providing the raw materials of the survey, Reiff and Dubbink wrote a thoughtful paper, with a small assist from the senior members of the UCLA Secretariat, which furnished an excellent foundation for the discussion on "Organization for Research" at the workshop/conference. This paper is reproduced in the present volume.

The reports of the working committees focused on what the participants saw as the highest priority research topics within each category; that is, those that were seen as deserving support by the National Science Foundation and other funding agencies potentially interested in promoting environmental research. To arrive at a sense of priorities cutting across all the categories, a Priorities Game, originally suggested by Donald McAllister, was organized, which involved setting down all the topics which had been mentioned throughout the total effort (i.e., in the report of the Steering Committee, in the background papers, in the reports of the Working Groups, and by the UCLA Secretariat) then asking the participants after the conference to vote on the relative importance of the various topics by the allocation of 1,000 "points" among them. On the basis of the "voting," McAllister and I edited and reorganized the materials, dropping those that had received relatively few votes, combining a few where duplication was involved, and then placing the subjects into three categories, two stars (**) for those that had received the most votes, one star (*) for the middle group, and no star for the third group. (See part I and chapters 12 through 17.) (It should be noted, however, that even this last group contains what were deemed high-priority topics for research, since those that received few votes were eliminated entirely.) Each of the Working Groups had developed a classification system to cover the research topics they had discussed, the most elaborate (and imaginative) being that of the Working Group on Environmental Sciences. The latter had developed a priority system of its own, including classes of "urgent, urgent" and "merely urgent," as well as classes that divided the proposed topics among long range, middle range, and short range, and among various degrees of complexity. We have reluctantly dropped the various schemes of classification to achieve some semblance of uniformity, maintaining only a few topical divisions. The final product of the Priorities Game is included in this volume, as are the Working Committee reports.

A final word on the problem of encouraging research in the field of environmental planning useful to the practitioners "on the firing line." The materials presented at the workshop/conference suggest a number of issues worthy of special attention:

The Introduction to this volume is a report on the workshop, written by one of the participants, Israel Stollman, executive director of the American Society of Planning Officials, and first published as an editorial in the September 1972 issue of *Planning: The ASPO Magazine.* It provides a practitioner view of what took place and, appropriately, does so against the background of the policy struggles concerning environment by our host community, Boulder, Colo. Both the practitioner view and the Boulder story, it seems to me, add a useful note of reality to the (sometimes) abstract subjects in the remainder of the volume.

Relatively little university research is today directed at even the most urgent problems of land-use planning; and, a more serious point, the university researcher and the planning practitioner are functioning in two totally separate worlds that have little contact with each other and are subject to different (and generally conflicting) rules of the game. It will take very serious effort to overcome the difficulties and to achieve an effective relationship between university research and the needs of those coping with the practical issues of land-use planning.

A key element in coping with the problem is to recognize the university as only one of the actual (and even more so, potential) suppliers of needed research, and to see the planning practitioner as only one of the major users of research concerned with environmental issues. There are many participants in the research "production and consumption" process and, in fact, all of them are both producers and consumers to some extent. This is true of the private sector taken as a whole, the political sector (including important ad hoc commission studies), private consultants, professional associations (e.g., the American Society of Planning Officials has a large research service geared to meeting certain needs of the planning practitioners), and citizen groups (including not only the Nader group, but such organizations as the Regional Plan Association of New York). As the Working Committee on Research Organization has pointed out, no group is totally supply oriented or totally consumer oriented, but it is significant that some (and particularly the universities, research centers and institutes, national laboratories, and commissions and task forces) are more concerned with longer run conceptual and theoretical problems, whereas the others have more immediate operating concerns and practical interests. This wide variety of interests and capabilities can be, and should be, turned into a source of strength in arranging for the supply of the great variety of needed research. Under present circumstances, only the major funding agencies that are concerned with environmental research can supply such research organization and what I would call a TLC (tender loving care) approach to the whole field of environmental planning research.

The recommendation that funding agencies deal with the full spectrum of institutions interested in, and capable of, doing research on land-use-planning issues carries with it a significant operational corollary. Such use of the full "research keyboard" requires–

- Substantial advance knowledge about the capabilities, special interests, and shortcomings of the research institutions, in terms of both group characteristics and individual characteristics.
- Careful monitoring of performance, including ability to (a) perceive problems (or problem sets), (b) meet time constraints, (c) produce "meaningful" research results, (d) disseminate findings effectively.
- An effort to consciously bring about a fit between the problems to be researched and the special capabilities and limitations of the various research institutions.
- A conscious effort to attract able persons into the field of land-use research (the poor reputation of the field in the past and the imperfections of the highly specialized research "market" make this special effort necessary).

- An effort to promote communication among the various "producers" and "consumers" in land-use research (through conferences, the preparation of handbooks, etc.).
- An effort to improve the capacity of "consumers" of such research to make the best of it.

The near-crisis situation in environmental planning suggests that the establishment of such organizations for research deserves priority attention from the major funding agencies. Hopefully, the National Science Foundation can take a leading role in such an effort.

I owe a large debt to Donald M. McAllister, who undertook the difficult task of editing this volume, bringing coherence to a disparate set of materials and setting high standards for the final version of the individual papers and reports. John Friedmann, whose excellent background paper had a substantial influence on discussions at the Boulder conference, also contributed importantly in the planning of the Steering Committee meeting and the workshop/conference. The other members of the UCLA Secretariat–Isabel Reiff, David Dubbink and Eugene Leong, Jean King, Sue Espinosa and Liane Keene–carried out the many tasks involved in planning and running the conference and assisting the editor with unusual effectiveness and good humor.

Special thanks are due to Larry W. Tombaugh, of the National Science Foundation, who conceived the entire project and provided substantial assistance at every stage in carrying it out.

Harvey S. Perloff.

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INTRODUCTION[1]

Harvey Perloff persuaded 40 people to spent some vacation time at a meeting in Boulder last summer talking shop: what are the most important things that we don't know, but ought to know, to do a better job of planning our physical environments?

The environment of the meeting was part of its persuasiveness. The big sky, clear air, and the delights of the Rockies illustrated why the voters of Boulder directed their officials to "take all steps necessary to hold the rate of growth in the Boulder Valley to a level substantially below that experienced in the 1960s" and to "insure that the growth that does take place shall provide living qualities in keeping with the policies found in the Boulder Valley Comprehensive Plan."

Windowless meeting rooms helped keep the group's attention fixed, for 10 days, on the assignment of producing a list of the highest priority research needs to help the working planner in his tasks.

The participants got better acquainted through critical discussion of a pile of background papers and then went to work writing a fresh pile. Many were university people: biologists, planners, economists, and others from psychology, sociology, geography, atmospheric science, and landscape architecture. They were sensitive to the word "academic" used as a sneer. The job of this meeting was to be useful to practitioners, in fitting the purposes of its sponsor, the National Science Foundation (NSF).

NSF has developed a stronger interest in supporting research that is oriented to problem solving. NSF programs have been grouped for this purpose under the title "Research Applied to National Needs" (RANN). The Boulder conference was carefully designed to look at planning problems that are at the cutting edge of practice. About half of the participants were practitioners with years of experience in planning at Federal, State, metropolitan, city, suburban, county, and inner-city neighborhood levels. They included specialists in environmental protection planning, private consultants, and a planner speaking for developer interests.

Boulder, with its recent growth curve as steep as its mountain neighbors, is part of the chain of cities that has been growing along the eastern edge of the Rockies as through the mountains were an ocean, studded with small towns like resort islands, and compressing urban growth along its coast. Boulder's interest in holding down growth–by coincidence–illustrates some of the major themes that were sounded by the conferees in problems they proposed for research.

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[1] This introduction is a reprint, in slightly modified form, of Mr. Stollman's editorial "A Meeting in Boulder" which appeared on pages 172-173 of the September 1972 issue of *Planning, the ASPO Magazine*, of the American Society of Planning Officials, Chicago, Illinois.

One of these is the theme of equity and accountability that recurred in proposals to probe detailed problems of citizen participation, decentralization of decisionmaking, attentiveness to weakly represented interests, fair treatment to property owners, users, and developers, and fair access to the use of resources. What constraints on freedoms are to be balanced how and by whom against the necessities of sharing a fixed land resource? Boulder raises the question of controlling who may move to where and further, how are the rather different interests of a metropolitan region, a State, or the Nation to be represented in influencing the flows of migration. A Boulder may say that jobs should move to Pueblo where there are unemployed. A Pueblo may say let the unemployed also move to where jobs are.

But Boulder's complex motives include a very strong concern for protecting an environment against the degradation of overuse. This is another theme prominent in the discussions. To balance competing demands on the environment, specific information is needed on the relative fragility or resilience of a particular spot when confronted with a particular land-use decision.

One of the six working committees that divided the total research territory concentrated on the application of environmental sciences to land-use decisions. It came up with such relatively simple problems as the better management of storm water in new development and such relatively complex ones as finding out how different patterns of settlement would affect the consumption of energy by transportation facilities.

This committee came up with a substantial list of important research, but found it hard to agree that any item on the list was less than urgent. And so they invented two categories of priority. One is "urgent urgent." The other is "merely urgent."

Boulder illustrates another research theme. Its voters have opted for action now to slow down growth. They also voted to study the problem. But the referendum instructs city government to act while the "definitive analysis of the optimum population," and programs of implementation are being made. And Boulder is acting. With water supply diplomacy, substantial charges for utility hookups, density controls, and discouragement of new industry, growth is being cut. The need to know and the need to act are tumbled together in this way in our common practical experience. Our work does not fit the steps in the neat sequence of the planning process except when we are self-conscious and analytic about it. Research is the business of the practitioner also, then, and he is running an experiment whenever he puts some new policy to work.

How are the experiments of practice working out? How effectively are plans implemented? Are we implementing the right plans? How good are the cost-benefit evaluations of competing land-use decisions? Are we getting bad side effects of land-use policies? Can we evaluate current programs in time to make changes?

The Boulder conferees proposed research into monitoring and evaluation methods, joked about muddling through versus modeling through, and listed many settlement problems and urban development strategies for investigation. A freer movement of people and ideas between university and planning agency—in both directions—was outlined, by Dubbink and Reiff, in a background paper to bridge the knowing and doing gap better.

This book, a report of the meeting that produced almost 100 high-priority research topics, should be influential in guiding RANN and other funding sources in support of land-use planning research. It should also give us a base for the maintenance of a continuing inventory of research that is needed to serve practitioners with proposals coming from a wider group of contributors.

The detailed job of designing the research, funding it, and doing it remains. The work of the Boulder conference is also a brief for generously expanding the financial support of research into land-use planning. The supply of legislation on land use will greatly outweigh the supply of information if we don't get answers, say, to three-quarters of the questions raised in moving planning research from "merely urgent" to "urgent urgent."

Israel Stollman.

PART I

RECOMMENDATIONS OF HIGH-PRIORITY RESEARCH FOR LAND-USE PLANNING AND ALLOCATION

PART I

RECOMMENDATIONS OF HIGH-PRIORITY RESEARCH FOR LAND-USE PLANNING AND ALLOCATION

The purpose of the workshop upon which this book is based was to forge an agreement among a small group of expert environmental/land-use planners and researchers as to those areas of research that meet two criteria:

(1) They are of the highest priority in terms of contributing now to the scientific basis for resolving the key issues concerning land use; and (2) they are amenable to attack by the scientific techniques that are either currently available or will likely be available in the near future.

The recommendations for research which follow represent an amalgamation of ideas that were brought to the workshop by outstanding participants facing particular problems in their own work, ideas that were stimulated by the working papers, and ideas that emerged through interaction at the workshop. In all cases, these recommendations were thoroughly scrutinized and discussed from both the standpoint of the likelihood of contributing to the burgeoning environmental/land-use considerations and from the standpoint of technical feasibility.

While there is some overlap in research topics and there has been little attempt to rectify the differing spatial and geographic regions implied by each recommendation, it is nevertheless argued here that the recommendations do deserve serious attention by the National Science Foundation and other funding agencies as important input into program designs for research support.

Five categories of recommendations are presented:

- Environmental science priorities for land-use research;
- Environmental and landscape assessment;
- Data requirements for land-use research;
- Settlement patterns and their relationship to land use; and
- Institutional policies and mechanisms.

These topics are discussed in greater detail in the working committee reports. Page designations refer to the location of these discussions in the text. The stars to the left of each recommendation designate the weight attributed the item by workshop participants. These weights emerged from a research priorities game in which each participant was asked to allocate 1,000 points among the many research topics suggested at the workshop. High-priority recommendations were grouped in three categories as a result of this polling. Two-starred items received the most votes. Many items received few votes and were eliminated from the book, so that even those items with no stars are nevertheless considered to be of high priority.

In summary, it is recommended that serious attention be given to the development of research programs on the following key issues concerned with environmental/land-use planning.

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**1. Air and Water Pollution Impact of Various Land-Use Patterns (p. 270)
**2. Determination of Biological and Physical Factors That Make Certain Ecological Areas Inherently "Fragile" (p. 273)
**3. Alternative Rates of Energy Consumption Resulting From Various Settlement Patterns (p. 276)
**4. Ecological Aspects of the Preservation of Inland and Coastal Wetlands (p. 272)
**5. Environmental Impacts of Specific Large-Scale, Interbasin Transfers of Water (p. 273)
**6. Maintenance Costs of Synthetic Biological Communities (p. 275)
**7. Criteria for the Location of Land Uses To Minimize Human Stress Caused by Noise (p. 273)
*8. Improved Methods of Weighting Land and Water Capability Factors in Planning (p. 270)
*9. Identification of Areas Involving a High Degree of Natural Hazard (p. 269)
*10. Study of Variable Risks and Environmental Perception Among Population Groups (p. 269)
*11. Effects of Various Methods of Solid-Waste Disposal and Product Design on Future Recycling Opportunities (p. 269)
*12. Relationship Between Intensive Development and Use, and Environmental Quality of Inland Lakes (p. 271)
*13. Impacts of Land Development on Local and Regional Hydrology (p. 271)
14. Criteria for Standards Relating to Mass, Shape, and Orientation of Buildings and Streets as Related to Atmospheric Parameters (p. 274)
15. Environmental Impacts of Urban Mass Transit Innovations (p. 275)
16. Methods of Reducing the Adverse Effects of Accelerated Storm Water Runoff From New Land and Building Developments (p. 269)
17. Communication Systems as Alternatives to Transportation (p. 276)

18. Waste Material Budgets for Major Industrial, Agricultural and Commercial Operations (p. 277)

19. Management of Byproducts of Air Pollution Control (p. 271)

20. The Impact of Trees and other Forms of Vegetation on Physical and Esthetic Needs in the Environment (p. 274)

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**2. Effects of Alternative Settlement Patterns and Rates on the Supply and Demand for Environmental Resources (p. 286)

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PART II
OVERVIEW ISSUES

Chapter 1

ENVIRONMENTAL/LAND-USE PLANNING: MAJOR ISSUES

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INTRODUCTION

It is being increasingly recognized that more effective land-use planning and control are the key to environmental protection and enhancement. This is evidenced by radical changes in land-use planning in some cities, by the "quiet revolution" in land-use controls taking place in many of our State governments, and by the movement toward a national land-use policy at the Federal level.

In a sense, land-use planning and control have been concerned with environmental problems for a long time. For example, an important purpose of zoning has been to protect people from the neighborhood effects of land use such as noise, fumes, smoke, and hazardous materials. But in a larger sense, today's environmental problems provide a new focus for land-use planning. The spillovers of land use no longer fade at the neighborhood level; they now pervade our urban regions, cross national boundaries, and someday may threaten our global life-support systems. The predominantly local orientation of urban land-use planning institutions was appropriate for dealing with the localized environmental problems of the past, but new and perhaps radical approaches to land-use planning are required for dealing with the pervasive environmental problems we face today and must confront in the future. I will refer to this new kind of planning as "environmental/land-use planning."

The environmental problems addressed in this book cover a broad spectrum. The coverage reflects the wide area of concern set forth in the National Environmental Policy Act:[1]

> The Congress, recognizing the profound impact of man's activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth, high-density urbanization, industrial expansion, resource exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental

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[1] Sec. 101(a) of the National Environmental Policy Act of 1969, Public Law 91–190, Jan. 1, 1970.

> quality to the overall welfare and development of man, declares that it is the continuing policy of the Federal Government, in public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.

In the same spirit, this book is concerned with *social* and *economic* conditions as well as the *natural environment.*

The geographical territory of principal concern here is not easy to define, but perhaps is best described as those areas of the United States to which John Friedmann refers as "urban fields":[2]

> . . . the urban field is more extensive in its spatial dimensions than any concept we have previously had of the city. Planners refer to it disparagingly as peripheral sprawl, and public policy has roundly ignored it. Yet the urban field continues to expand and develop. More than 90 percent of the American people are residing within its boundaries. The urban field has become our home. We are born there, we live there, we are buried there
>
> The urban field may be described as a vast multi-centered region having relatively low density, whose form evolves from a finely articulated network of social and economic linkages. Its many centers are set in large areas of open space of which much is given over to agricultural and recreational use. The core city from which the urban field evolved is beginning to lose its traditional dominance: it is becoming merely one of many specialized centers in a region.
>
> . . . If we center the urban field on a city of intermediate metropolitan size, its physical reach would extend for roughly two hours' driving distance from this center—and less where adjacent urban fields contain it—encompassing an area of as much as 9,000 to 15,000 square miles, or roughly two to three times the size of Connecticut. By this measure the 100-odd urban fields we have today would cover approximately one-third of the total land surface of the continental United States.

Although the urban field is the primary geographic focus of this book, there are some important exceptions. These stem primarily from the fact that, as we have learned in analyzing urban/regional and ecological systems, virtually everything is connected to everything else. Hence, some attention is given to such factors as the socioeconomic problems of rural areas and declining regions, and the natural environmental problems of fragile ecosystems and remote recreation areas which are heavily used during holiday and vacation periods.

ORGANIZATION OF THE BOOK

This book is divided into four parts. Part I presents the recommendations of high-priority research for land-use planning and allocation that were developed by the workshop participants. Part II contains this introductory chapter and an excellent historical overview of land-use planning in the United States prepared by Marion Clawson. Part III comprises a collection of nine papers devoted to various topics concerning the social, economic, and natural environmental factors important to environmental/land-use planning. They were prepared in advance of the conference to serve as background papers for the work at the conference. Part IV contains six committee reports which were prepared during the conference. The discussion that follows focuses on the major themes treated by the background papers in part III.

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[2] John Friedmann, "The Future of the Urban Habitat," Chapter 3 of this book.

The authors of these papers are nationally known scholars in a wide variety of fields especially important to environmental/land-use planning. Most have already made major research contributions. They are also characterized by their multidisciplinary orientation and broad concern for societal problems.

The breadth of coverage in most of these papers makes it impossible in the strict sense to organize them into a few simple categories. For example, all the papers address problems of institutions or implementation. Also, all papers contain some reference to social, economic, and natural environmental problems. Each, however, can be identified according to its primary focus.

The papers by Cooper and Vlasin, Twiss, and Croke focus primarily on the natural environment while the other papers focus primarily on social and economic considerations, as shown in the table below.

Chapter	*Author and title of paper*	*Principal focus*
3	John Friedmann *The Future of the Urban Habitat*	Human activities and political behavior of individuals in the urban field.
4	Edward A. Ackerman, Robert G. Dyck, and Atlee E. Shidler *Land-Use Institutions in the Washington-Baltimore Region–A Mirror for Metropolitan America*	Development activities and planning institutions in the Washington-Baltimore area.
5	Lloyd Rodwin and Lawrence Susskind *Land-Use Research Issues Suggested by a National Urban Growth Strategy*	National urbanization policy.
6	Richard F. Babcock and Fred P. Bosselman *Conflicts in Land Use*	Legal issues.
7	Ralph d'Arge *Economic Design of Environmental Institutions*	Economic evaluation of institutional design.
8	William Cooper and Raymond Vlasin *Ecological Concepts and Applications to Planning*	Ecology.
9	Edward Croke *The Impact of Land-Use on Environmental Quality*	Pollution.

Chapter	*Author and title of paper*	*Principal focus*
10	Robert Twiss *Planning for Areas of Significant Environmental and Amenity Value*	Physical planning in high amenity areas.
11	David Dubbink and Isabel Reiff *University Research and Practice: An Institutional Confrontation*	Institutional setting for research.

In "The Future of the Urban Habitat," John Friedmann paints the future urban landscape in broad strokes, identifying the major social, economic, and political forces with which the environmental/land-use planner must cope. He observes that a new pattern of human settlements is emerging which he refers to as the "urban field." The boundaries of the urban field are defined by the spatial patterns of human activity that now extend well beyond the edges of our metropolitan areas owing primarily to the greatly increased recreation surge on weekends, holidays, and vacations.

Friedmann foresees a continuing trend in residential sprawl motivated primarily by the increasing demand for control over one's immediate environment. The continuation of sprawl coupled with greater diversity of choices in jobs, shopping, services, and recreation will require a type of mobility made possible only by continued reliance on the automobile.

Friedmann warns us of the impending problems if we do not come to grips with our urban governance problem:

> Most people are unaware that by acting as individual consumers of space they do not get what they would want as members of the commonwealth that sustains them. As citizens of urban fields, they get what they ask for, affinity environments and metro-centers. But these private goods are purchased at great cost. Amenity resources of the urban field will be impaired until they cease to be attractive. More seriously, the diligent search for consumer satisfactions and security of private space on the periphery has led to the massive exodus of whites from central cities. Minority populations have occupied the vacant homes they left behind, but not in numbers sufficient to avoid the virtual abandonment of many residential areas.

A serious obstacle to improved governance is found in the observation that—

> The urban field does not inspire civic loyalty. Given the present lack of civic concern with the urban field as a whole—a lack that partly reflects the invisibility of its network and functional relationships—the most probable outcome for governance is a gradual evolution of power from local communities upwards to state and federal levels.

In their penetrating analysis of "Land-Use Institutions in the Washington-Baltimore Region," Ackerman, Dyck, and Shidler provide excellent insights into the institutional problems which must be overcome in order to provide more effective land-use control in our major metropolitan areas.

In analyzing the characteristics and operations of land-use institutions, the authors find it helpful to distinguish four zones of development. Zone I is the most centralized geographically, containing the District of Columbia and the city of Baltimore. It is characterized by dense occupance and scant vacant land. "A considerable amount of land has declined in economic productivity or social usefulness because of the obsolescence of structures, careless maintenance, vandalism and abandonment."

Zone II is made up of the eight counties surrounding zone I. It contains about 10 percent of the land area of the metropolitan region and was the most rapidly growing section in the 1960's. Zone III comprises the next successive tier of seven counties and is "becoming the scene of the most active subdivision development in the region."

Zone IV is made up of the outermost tier of about 60 counties extending into four adjacent States. It is an important part of the open space of Washington and Baltimore, which draw heavily on this zone to meet their increasing demands for outdoor recreation.

It is interesting that, in this analysis of the Washington region, the authors have bounded and dissected an "urban field." (It should be noted that Friedmann and the three authors were unaware of each others' work while they were in preparation.) The resulting anatomy further clarifies and enhances the urban-field concept and provides a valuable structure for studying land-use institutions and socioeconomic problems in urban areas.

The authors find that the strength of land-use controls declines as one moves from the central zones outward. Hence, the areas experiencing the most rapid change in land use are least equipped to control development. Weak controls are a characteristic of the shortcut development sequence which results in higher costs of local infrastructure and public service operations. The authors indicate that the preferred planning procedure is the "balanced" development sequence, but newly developing communities seldom initiate this approach. Instead, it is usually evolved out of the unfortunate experience of employing the shortcut approach in which the private developer has primary control.

Another problem is the difficulty in dealing with major, regionwide problems such as (1) the efficient movement of people in an increasingly mobile age, (2) the provision of adequate housing for all classes of people, (3) the satisfaction of esthetic and environmental needs, and (4) the provision of jobs for all groups of people.

To deal effectively with these and other problems in a highly interconnected metropolitan region, regionwide coordination is obviously required. However, as in most other metropolitan areas, the planning authority in the Washington region is splintered among its many municipalities, and planning functions are fragmented among a hundred public institutions. As a result, the patterns of land development in the region have been shaped largely by the uncoordinated actions of thousands of private developers.

Ackerman, Dyck, and Shidler note that

> if land-use development in a metropolitan region is seen as an activity in which multiple-purpose planning is unavoidable and action in one jurisdiction or geographical area effects others, then the present system must be regarded as seriously faulty. The problem then becomes one of determining the metropolitan equivalent of institutions that have been able to produce outstanding results in river basin planning and water development.

In general, the authors' discussion of potentially beneficial institutional changes involves shifting certain planning authority to the regional, State, or interstate level.

Rodwin and Susskind discuss the land-use implications of a national urban growth strategy, placing special emphasis on the socioeconomic problems to which environmental/land-use planners must be sensitive. They foresee the emergence of an urban growth strategy, placing special attention on three major land-use issues. First is the push for ethnic autonomy. The authors feel that this issue is particularly crucial, predicting that racial and ethnic matters will come to dominate land-use planning.

The second major issue which will be addressed by an urban growth strategy is the organization of metropolitan growth to deal with such problems as the disparity in services and environmental quality between central cities and suburbs, and inadequate housing and employment opportunities for low- and moderate-income residents. The third issue is the development of lagging regions, which the authors think will be encouraged through the use of new towns and the decentralization of our major cities.

In their discussion of land-use conflicts, Babcock and Bosselman expose the lawyer's view of some environmental/land-use problems. Their comments should serve as a warning to the planner that legal issues and constraints cannot be ignored.

Several of the issues they discuss are closely related to issues raised in other papers. One is concerned with the fact that many municipalities are requiring residential developers to provide an expanded set of public facilities at their expense, such as additional land for schools and recreation. This requirement might be viewed as a means for rectifying the short cut planning sequence identified by Ackerman, Dyck, and Shidler. Babcock and Bosselman feel that the practice should be studied for its economic soundness and social fairness.

Another issue concerns the no-growth and limited-growth policies that a number of communities have adopted within the past few years. Such policies are typically adopted to "protect the environment," but an important question is who benefits and who pays? The authors ask if this is another case of "Bos'n, pull the ladder up; I'm aboard." They suggest that study is needed to determine the impacts and incidence of no-growth policies so that legal tools can be designed to provide an equitable approach.

A related issue concerns the control of migration to avoid overloading the assimilative capacities of local ecosystems. Ecologists warn that such controls are already necessary, but the authors note that our constitutional tradition of free movement within the country is at stake.

Ralph d'Arge's paper is a path-breaking contribution to the "new" political economy. His economic analysis of institutional design for environmental/land-use planning should be read carefully by anyone with a theoretical or practical interest in institutional control strategies for environmental protection.

A central concern is the choice of the control mechanism to yield cost-effectiveness results. An important distinction for this purpose is the directness or indirectness of the control. Direct controls are applied at the source of the problem with stiff penalties that make avoidance very costly and leave little room for private options. An example would be the closing down of a factory that emits pollutants above predetermined standards. The use of direct controls usually involves very high enforcement costs. Indirect controls are characterized by two or more cause-effect linkages between the application of the control and response to the problem. An example is a pollution tax which the polluter may decide to pay rather than incur the costs of curtailing pollution. Because of the uncertainty of its results, the effective application of indirect controls involves high information costs. The analysis suggests that the total cost of enforcement plus information is minimized by selecting a control device which balances the two extremes.

A closely related question is where to apply the control. d'Arge argues that to answer this question one must consider the number, type and cost of alternative methods of effective response by the prospective candidates for governmental control. Generally, controls will be most effective when applied to the decisionmaker with the widest scope for corrective action.

d'Arge discusses several questions concerning the organization of control agencies. An especially interesting issue is the degree to which an agency should be equipped with a wide variety of control techniques. Although a specialized agency with a single mission and equipped with a single control strategy may be the most efficient in dealing with its specific assignment, the use of specialized agencies may be least efficient in the long term considering the rapidly changing character of our environmental problems. The problem has its analogy in the biological world where highly specialized species are very efficient in their narrow ecological niche, but are vulnerable to changing environmental conditions.

The paper by Cooper and Vlasin on "Ecological Concepts and Applications to Planning" is a cornerstone of this volume. In it the authors elaborate the ecological relationships and concepts most critical to sound environmental/land-use planning. They conclude their paper with an excellent discussion of institutional issues from a broad ecological perspective.

In understanding the ecological basis of our environmental problems, a central concept is the "assimilative capacity" of the natural environment. Every local environment has a limited capacity to assimilate waste material in a fashion acceptable to man (in terms of health, esthetic, recreation, and other values). This capacity is being violated in many areas because of the heavy spatial concentrations of people and economic activities. In calculating the economies of large scale, man has failed to take account of the external costs of environmental degradation.

The authors suggest that a possible solution to this problem would be to calculate the unused assimilative capacity of our natural environments on a region-by-region basis and develop an institutional guidance mechanism to prevent the utilization of any local environment beyond its capacity. Growth would be directed to those areas capable of increased resource use and waste processing. Natural environments with very high assimilative capacities would receive special attention in such a program.

To properly implement the system, information is needed regarding the assimilative capabilities of all local environments and their present level of use. The acquisition of this information will require extensive research to quantify the capacities for a large number of environmental characteristics and circumstances. The authors suggest that we are much closer to understanding what is economically and socially desirable than what is ecologically acceptable.

Croke focuses special attention on the pollution impacts of urban land use. He explains that, until recently, the environmental protection programs have emphasized the technological control approach. It is now recognized, however, that pollution standards cannot be met in many of our major metropolitan areas through the use of technological controls alone. In the future, land-use planning must play a greatly expanded role in environmental protection. Our ability to accurately model the environmental impacts of land use is the key to the effectiveness of such a program. Many models have already been developed for this purpose, but much work remains to be done.

Croke also places strong emphasis on the concept of assimilative capacities for effective environmental/land-use planning. He notes that the adoption of uniform pollution standards diminishes the possibility of taking advantage of spatial variations in the assimilative capacities of natural environments or of including desirable spatial concentrations of related pollution-producing activities.

The author suggests that an important component of environmental/land-use planning should be the use of growth-inducing public facilities for encouraging growth in desired locations and spatial configurations. In the past, the planning of transportation, water, waste-water treatment, and other major facilities has been based upon growth projections rather than desired growth patterns.

Perhaps the most serious problem in dealing with air pollution is the vicious cycle between transportation planning and urban growth, which continuously reinforces suburban sprawl and automobile domination.

Twiss discusses the approaches, problems, and research needs in planning for areas of significant environmental and amenity value. The paper provides a well-integrated overview to planning in high amenity areas and very neatly organizes and summarizes much of the past research work related to such planning.

Some of the planning problems which the author identifies concern site planning data, environmental indicators, and coordination of functional plans. A major problem in planning the development of specific sites in high amenity regions is that little information is available which relates site development impacts to regional goals. The author suggests that site planning could be improved by the availability of checklists and interpretive maps which express regional concerns overlapping any given site.

At the regional level, planning is hampered by data problems, including their relevance, adequacy, validity, and comparability. Consequently, it is usually impossible to forecast accurately the environmental impacts of the typical county general plan or park master plan. (An exception is found in the Tahoe regional plan.) In addition, much work is needed to improve the set of indicators of environmental quality.

Twiss indicates that functional planning (i.e., planning for specific types of land use such as transportation, recreation, or housing) is the principal form of planning today in high amenity areas. The major problem with functional planning is the lack of coordination between the various functional plans in a given region. A number of approaches have been taken which attempt to achieve coordination between functional plans and projects. Perhaps the most significant device for coordination in high amenity areas is the analysis of environmental impacts in the form of the environmental impact statement, but many problems remain to be solved.

In reading through the papers in part III, one will find many recurrent themes and interrelated issues of special significance to environmental/land-use planning. I will relate just a few of them here.

The concept of assimilative capacity was discussed by Cooper and Vlasin, Croke, and Twiss. They all indicate that we must determine the assimilative capacities of our local environments and incorporate this information into planning policies that will protect local environments from excessive use. Planners should become aware of the fact that assimilative capacities vary from one area to another and build this knowledge into their plans. Uniform emission standards may have many advantages, but an important disadvantage is that they could destroy the opportunity to make constructive use of spatial variations in capacity.

It should be noted that the determination of assimilative capacity cannot rest on science alone, since environmental "degradation" is a personal judgment. Hence, an important dose of human values is involved in the typical "tradeoff" decision that has to be made. Thus, for example, a community that adopts a no-growth policy to protect the local environment from excessive use is subject to criticism on equity grounds (as by Babcock and Bosselman). However, sometimes the situation is reversed. Twiss notes that the protection of environments in many high amenity areas is a special problem because typically the costs must be borne by the local residents, whereas the benefits may accrue to the residents of an entire region or even the Nation as a whole.

Looking into the future, the protection of ecosystems may require an interregional migration policy. Such a policy may be linked to policies for encouraging the development of declining regions (discussed by Rodwin and Susskind), but it may have to be squared with the constitutional right of free movement (as per Babcock and Bosselman).

Related to the problem of protecting the natural environment from excessive use are the issues of scale economies and recycling of scarce, nonrenewable resources. To the extent that we encourage the dispersion of populations, we may sacrifice important scale economies in waste processing that could aggravate our environmental problems. Also, the dispersion of populations may serve to scatter valuable, nonrenewable resources (such as platinum and nickel) found in waste, which may preclude the use of technological breakthroughs for recycling these materials.

The contribution of serious air-pollution problems seems inevitable. Friedmann and Ackerman, Dyck, and Shidler report that the trends in urban sprawl and the demand for travel convenience are strong. Friedmann foresees the urban field as the future urban habitat dominated by the automobile. Hence, the vicious cycle between sprawl and the auto, identified by Croke, will be even more difficult to break in the future, which does not bode well for the quality of air in our major metropolitan areas (barring unforeseen technological breakthroughs in auto emission controls). The only solution may be to adopt a strong national urbanization policy to encourage growth away from these areas.

The lack of coordination between different planning authorities in a given geographic area is cited as a major institutional problem by several of the authors. An illustration of the magnitude of this problem is provided by Ackerman, Dyck, and Shidler in their analysis of planning fragmentation in the Washington region.

An important and related issue is the geographic coverage of planning institutions. There is uniformity in the view that planning authority in certain fields must be shifted from the local level to the regional, State, and interstate level. There is justification for this view in social and economic as well as natural environmental considerations. In the socioeconomic realm, the huge territory of urban fields and the regional importance of their resources and problems are cited. The large geographic scope of many natural systems, such as air sheds, water sheds, and other important ecosystems, also argues for environmental/land-use planning at a larger scale than formerly. The authors point out, however, that the redesign of institutions for planning must carefully consider the rising demand for "local control" and "home rule." As usual, choices have to be made between cherished, but conflicting values.

The role of universities and their research components in contributing to land use research is discussed in Chapter 11 by Dubbink and Reiff. Based on a series of interviews, the coupling between research performers and users that constitutes the transfer process is analyzed. There are clear problems of perception, communication and transfer between academia and practitioners. Successful bridging of this institutional gap is necessary for research results to impact the problems of society.

CONFERENCE COMMITTEE REPORTS

The six reports contained in part IV of the book were prepared by working committees (of between five and nine persons) during the 2-week period of the conference. The principal task of each committee was to prepare a list of high-priority applied research topics of special importance for improving the effectiveness of environmental/land-use planning,[3] drawing on the background papers appropriate to each theme.

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[3] A priority ordering is indicated in each of the reports by a system of stars. The ordering of priorities was not established by each committee, but by the larger group of conference participants as explained in the foreword.

One group focused its attention on the additional knowledge in the "Environmental Sciences" that can be applied to land-use decisions. "Settlement Patterns" were analyzed by a second group, with special attention to the social and economic problems that have important spatial dimensions.

An "Environmental Assessment" group concerned itself with evaluations of social, economic, and natural environmental impacts of alternative actions to decide which action is "best." Determining the appropriate tradeoffs between environmental quality and other societal goals is particularly difficult. Hence, the improvement of assessment methods is considered very important to the field of environmental/land-use planning.

"Data" was chosen as a separate topic because of its central role in research and the practice of planning, and because of the feeling that substantial gains can be made in the improvement of existing, and the creation of new, data management systems. Finally, "Institutions" was chosen as a committee topic because of the importance attached to the implementation of environmental plans.

The committee reports drew heavily on materials in the background papers, but added many new insights and ideas on research needs at the frontiers of applied knowledge.

A major theme that runs through many of the research items is the need to invent new futures for human habitat and new methods for dealing with our environmental problems. Emphasis is placed on the design of new land-use patterns to cope with particular problems, such as air pollution (e.g., by minimizing automobile use) and energy consumption, or in maximizing social equity and the quality of services to residents of rural areas.

Another important theme is the need to improve our knowledge of the environmental impacts of development and methods for estimating these impacts. Examples are the need for more specific information on the impacts of land development in areas of critical environmental concern, the impact of special land uses such as feedlots and intensive agricultural practices in urban areas, and the impacts of large-scale water transfers.

Several of the research topics address the need to translate existing scientific knowledge into operational guidelines for use by practitioners. The issue of citizen participation and access is also common to several topics, including the issues of participation in the planning process and in procedures for environmental assessment, as well as access to information and data usually reserved for use by technical experts. These themes cover only a fraction of the 60 research topics recommended in the committee reports.

In conclusion, the papers and reports in this book reflect the great potential for land-use planning in dealing with environmental problems and opportunities. They serve, however, to underscore the complexity of the issues and the enormous importance of acquiring more knowledge to transform this potential into a reality.

Chapter 2

HISTORICAL OVERVIEW OF LAND-USE PLANNING IN THE UNITED STATES

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INTRODUCTION

The history of land use in the United States, and its planning, is complex and detailed; there are literally thousands of aspects, incidents, and events that might be included. Extensive books have been written on rather specialized aspects; for instance, Gates has recently written a long and heavily documented story of the development laws relating to the Federal lands and other books have been written on equally specialized aspects of land-use history. An "overview" implies something much briefer and therefore selective; the process of deciding what to include as important, and what to omit, is far from easy. At best, the process is a somewhat subjective one, into which the interests and biases of the historian inevitably enter to some degree.

One question may well be raised at the beginning: Why review history at all? Some people, whether professional or amateur historians, find history so interesting and absorbing for its own sake that no further defense is needed, or indeed possible. History has a more utilitarian value for the solver of current problems: Unless he understands the background from whence he came, he cannot really understand where he is, much less where he may be going. On this view, the basic foundation for planning for the future is a reasonable knowledge of the past. Because historical trends and currents usually continue into the future, modified and changed but often still powerful, they must be taken into account. In asserting the value of history for the planning of the future, we should not assert or imply that historical trends are incapable of change–that "what will be, will be, and nothing can change it." Trends need not be accepted as immutable, but a trend adapter or a trend setter should be a trend knower. It is in this spirit that this paper has been written.

Two dominant themes run through this paper: (1) development of land has been an ideology of the American society and economy; and (2) the balance of power has gradually shifted in favor of public interests in land (publicly and privately owned), rather than private interests.

Throughout our American history, the drive for economic development, which often meant resource exploitation, has been very strong. The colonists sought to clear land so they could grow crops; their very survival was often at stake, but currency earnings from export crops, such as tobacco, were also highly important. An unsettled "wilderness" was a challenge in the same way that an undeveloped damsite was a challenge to the engineer. While we have often poked fun at the extreme chamber-of-commerce attitudes, as a people we have usually equated "bigger" with "better." The drive for development was largely fueled by the desire of each individual to better his personal position. Furthermore, public efforts were often enlisted in the support and the powers of government were often directed toward economic development generally and a private development, with emphasis on resource development.

But private and public efforts at economic development have taken place within a broad social, economic, and political framework; the rights and duties of the landowner have been those established by the larger society. The whole concept of landownership has changed over the decades, private ownership of land has always rested upon public acceptance, as reflected in laws and customs, but the rights and privileges of that ownership can be, and have been, changed over the decades. There has been some publicly owned land in the United States since the earliest settlement, but the role of that public land has shifted materially. As our country developed from a thinly settled and economically backward society into a populous and economically advanced one, changes became inevitable; what was proper or at least permissible for a landowner to do with his land, when his nearest neighbor was miles away, often became intolerable when his neighbor was on the next suburban lot a few feet away. The public interest in private land use, and in management of public lands, has found expression in innumerable interesting ways; we shall cover some of the more important of them.

Two general strictures should be borne in mind: (1) much land-use planning in the United States, especially in earlier days, is done by men who do not call themselves planners and who are not generally regarded by their professional contemporaries as professional planners. They may be engineers, sanitary experts, bankers, or come from any one of a number of other professional backgrounds, yet they make, or help to make, plans for the use of land; (2) land-use planning must always be judged in the context of the times in which it takes place--not only the technological context, but the economic and social context as well. For instance, some of the planning for the disposal of public lands to private ownership, 100 or more years ago, may seem today crude or ill-advised, but there may be no evidence that today's planners, operating in those times, could have done any better.

THE COLONIAL PERIOD

Most historical accounts of land-use history in the United States ignore, or at most treat very briefly, the colonial period of American history. If "national" is taken to mean only that which occurred after the Nation was established as a separate governmental entity, this ignoring of the colonial period is correct. But, in a great many ways, what has happened in land-use history since the United States was established as a sovereign government is but the flowering of the seeds planted during the colonial period; national history is an outgrowth of colonial history, and nowhere is this more marked than for land history. Men who had been active in forming colonial land policy continued to be active in formulating national land policy, and systems of land tenure and land use which had developed during the colonial period carried into the early national period, without significant modification merely because of nationhood.

One must recall the conditions of the early Colonies. Land was plentiful; it was unimproved, meaning that in practice along the Atlantic seaboard it was usually covered with forests which had to be removed before crops could be grown. Often it was so isolated that its products could not be marketed satisfactorily anywhere. Capital to invest in land, or in combination with land, was scarce. The earliest colonists, who often lacked domestic livestock, did not know how to care for imported animals in the new and often difficult climate and environment; death losses among costly imported livestock were high in the early days.

These colonists lacked farm machines, too, and even simple tools; they could make things out of wood, which was ubiquitously available and generally of superb quality compared with what they or their forefathers had known in the old country, and they were enormously inventive in devising wooden articles of many kinds.

Labor was about as scarce as capital; the accounts of indentured servants, or of colonies established from prisoners, show how great the need was for labor—and for women.

Although economic development during the colonial period was at a much lower level than it is today, the drive for it was perhaps even stronger than it is now. The colonists had come to the new land for a variety of reasons, an important one of which was usually betterment of their personal economic situation. The new land presented many challenges, and personal comfort and even safety were at stake. The drive to obtain land, clear it, grow crops, erect buildings, and generally acquire productive farms was very great. Public or governmental efforts to aid private enterprise were at a lower ebb but not entirely lacking.

By the early 17th century, at the time of the earliest permanent settlements in the present United States, feudal tenures had largely disappeared from Britain and European countries. Certain legacies, however, in the form of restrictions on inheritance and land disposition had lingered on. The colonial period in America was one of great liberalization in the right of the individual to bequeath his land as he chose, to sell it as he wished, and to use it as he decided. By the time of the Revolution, the concept of fee-simple ownership of land was firmly established and nearly universal in the Colonies; in its extreme form, it gave the owner the right to land from the center of the earth to the zenith of the sky, to own and to hold, to use and to abuse, as he, and only as he, saw fit. While he might then and later be held accountable, at least in theory, for damages done to neighbors, in fact, the courts took a dim view of his reponsibility to neighbors; this, together with the fact that neighbors were often distant and values were low, almost totally removed all limits on the individual's use of land.

There was a good deal of land planning in the colonial period, although the persons involved were not called land planners. The New England style of settlement involved the granting of settlement rights to a group of individuals, for a designated area. They established a "new town," usually with a town common (to graze the milk cows near at hand), assigned to individuals small lots or tracts of land in the town, for buildings, gardens, and a few intensive crops, and larger fields farther out, for more general cropping. Reserved forests on lands less suitable for cultivation or more distantly located were often assigned to individual or group ownership.

Some of the land subdivision plans were based on rather shrewd appraisals or classifications of the land. One town was usually fully settled before another was established. Towns often had a social cohesiveness, often based in part upon a common religion. Local town authorities were responsible for land survey, land subdivision, and land title records.

In the Southern Colonies, the land settlement system was different. The individual was responsible for selecting the tract of land he wanted; as he was under no legal compulsion to select it near existing settlements, he could move into generally unsettled territory. His boundaries might, or might not, coincide with those of his neighbors, if any; he was responsible for having his title recorded in the local courthouse and for having his land surveyed. This system rested on a concept of land planning, no less than did the New England system.

ORIGINS OF FEDERAL LAND

Any historical account of land-use planning in the United States should include a consideration of the origin of the Federal lands. A process of land acquisition by purchase, treaty, and war greatly expanded the territory of the Nation and provided an enormous area of land in public ownership. Its history is important for at least two reasons: (1) a very large heritage of Federal lands has been left in the United States–literally *One Third of the Nation's Land;*[1] (2) public opinion and governmental action may unite to accomplish desired ends, even when the latter conflict with ideological or philosophical positions.

The Federal lands came into being before the Colonies had gained their full independence. Of the thirteen Original Colonies, seven claimed extensive areas of land outside their modern boundaries. The other six Colonies had no such land claims.

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[1] Public Land Law Review Commission: *One Third of the Nation's Land,* Government Printing Office, Washington, June 1970.

In 1781, New York ceded to the new nation her claims to about 200,000 acres of land in what is now northwestern Pennsylvania. The other land-claiming Colonies also ceded their lands, some with reservations from which they later made grants to war veterans. By 1802 all the land outside the present boundaries of the land-claiming Colonies, extending to the Mississippi, had been ceded to the new national government.

In 1803 President Jefferson concluded a treaty with France to make the large Louisiana Purchase for the then-munificent sum of $15 million (the ultimate cost was $27 million). By comparison with national income, this was roughly equal to $200 billion today. In one swoop, Jefferson obtained title to over 500 million acres of land, gained control over the Mississippi, and ousted a foreign power. It was at once a magnificent real estate deal and a major national coup. The land, however, was then nearly all unexplored wilderness. One can imagine the howl that would go up if some modern President agreed to purchase, for example, all Russian rights to Antarctica; the comparison is not quite fair, but it gives some idea of the boldness of Jefferson's step.

The next major acquisition was the purchase of Florida from Spain in 1819 for somewhat more than $6 million at 15 cents an acre, or about three times what had been paid for the Louisiana Purchase. The high price paid off; boundary disputes with Spain were resolved and another European power was excluded from what is now the United States.

War between the United States and Mexico in 1846 led to our annexation of the Pacific Southwest, including California. The treaty provided that the United States would pay Mexico $16 million, or about 5 cents an acre. By treaty with England in 1846 the United States acquired the whole Pacific Northwest. The Gadsden Purchase in southern Arizona and some miscellaneous other acquisitions rounded out the 48 States. In 1867 Alaska was purchased from Russia for about $7 million. Hawaii, Puerto Rico, and various other offshore possessions were acquired later.

The land in each of these acquisitions became the property of the United States, in the proprietary as well as in the governmental jurisdictional sense. There were some private land claims in each, at the time of acquisition; those which could be verified as well as some whose claims were shadowy or worse, were confirmed to the private claimants. From time immemorial all the land had "belonged," in some sense of the word, to Indians (or in Alaska, to Aleuts and Eskimos also). In a series of "treaties," the Indians were pushed off their lands, and often confined to reservations, in a series of episodes which are among the least glorious of American history. The situation was more complex than the usual popular account today would have it; the basic problem was that Indian and white concepts of landownership and land tenure were so different that there was no real meeting of minds. Neither side was very good at keeping the bargain, at least as interpreted by the other side. In modern times, Indians have been permitted to sue in special courts, sometimes to have land restored to them, more often to get payments for the lands lost, and settlements of many hundreds of millions of dollars have been made.

By these processes the U.S. Government has, at one time or another, been the owner of 1,442 million acres of land within the 48 States, or 77 percent of their total area, and of 385 million acres, or virtually 100 percent of Alaska. Today, total Federal landholdings are 755 million acres, of which 699 million remained from the original public domain, the other 56 million acres having been purchased, for one reason or another, from previously private owners. Nearly 60 percent of the original public domain has been disposed of; the percentage is much higher, if Alaska is left out. For the vast majority of privately owned land in the United States today, the first step in its legal title is its transfer from public to private ownership.

Although territorial expansion of the continental United States ended with the acquisition of Alaska in 1867, the acquisition of land by the Federal Government has continued until the present. From the year 1891, large areas of Federal land became reserved as national forests. But although many people in the eastern half of the United States very much wanted the establishment of national forests, there was little or no remaining public domain in these states.

In 1911 the Weeks Act provided for the purchase of private lands to create national forests. There was extensive debate in the Congress about the constitutionality of such Federal land acquisiton; the Constitution clearly provided that public lands should be managed, but were silent on the matter of land acquisiton. The debaters, and the act itself, laid great stress on the role of forests in regulating streamflow and hence preserving navigability of streams–a matter clearly within congressional authority. Today, we consider forests in terms of their use as producers of goods and services, rather than emphasize the stream regulation aspect. During the Great Depression of the 1930's the Federal Government bought several millions of acres of land–"submarginal lands" on which families had become stranded, unable to produce a reasonable living. In addition to all this, the Federal Government has bought land for military uses and for public installations of all kinds.

In still more recent times, the Federal Government has provided grants to cities, counties, and States in order that they might acquire land for parks, open space, and other uses. Although the acreages so acquired have not yet become extensive, and perhaps never will, they are often valuable as to location.

Any consideration of the history of Federal land acquisition leads one to some major conclusions which may have relevance for the future:

1. The landownership situation in the United States always has been, is today, and probably always will be, a mixture of public and private landownership. The national area is made up of one-third Federal lands. This has been the case for 175 years, and it will probably never change significantly; on an area basis, Federal landownership is highly important. Federal landownership is very much a part of the American historical, social, and political tradition.

2. When the realities of a situation seem to demand it, public acquisition, ownership, and management of land is accepted, in spite of many philosophic commitments to private landownership. When the Federal lands were first

acquired, their ownership was seen as temporary or transitional. But permanent Federal ownership is now strongly endorsed by the total electorate; no sane politician today runs on a program to eliminate the national parks, or the national forests or even the remaining grazing lands.

3. Many ways exist to manage and use land; the American society is a pragmatic and adaptive one, for land as for other resources.

NORTHWEST ORDINANCES OF 1785 AND 1787

The new Nation quickly enacted major legislation concerning the lands it had acquired. Two laws, the Northwest Ordinances of 1785 and of 1787, deserve special comment because they laid the groundwork for so much that has ensued in American history.

1. The lands acquired by the Federal Government should be formed into new States, fully equal in every respect to the original States. Although the Federal land generally had to be administered as territories, this was a transitional stage which ended when settlement and economic development permitted Congress to admit the territory to full statehood. Any idea of a permanent colony or dependency situation was rejected. While this may seem obvious today, it was not necessarily the only acceptable course when these two laws were passed.

2. A system of Federal land grants was begun. When Ohio was admitted to the Union in 1802, it was given 1 square mile (or section) out of each township of 36 square miles for the support of its common schools. From this beginning, the idea of Federal grants of land was extended to other purposes–higher education, such as the land-grant colleges; railroads, roads, and other transportation; and swamp and overflowed land which was given to the States, in the hope that this would result in their improvement. The actual granting of land had become relatively unimportant by the end of the 19th century, but Federal cash grants began to take place of grants of land, and such Federal aid has become a major aspect of the governmental situation in the United States today.

3. The Northwest Ordinances provided a Federal system of land survey and records. Before then, the New England towns had made their own survey and maintained their own records. Southern colonies had a system of survey and records based more upon individual action, and the middle colonies had various intermediary systems. Land survey and permanent identification of land boundaries was not a simple matter. There was much debate as to the best and most practical system of land survey. Various ideas were put into practice in Ohio, the first of the Northwest Territories to be settled on any substantial scale, and today Ohio is the land surveyors' curiosity shop. Gradually, however, a system of land survey was put into practice. It was based upon major township lines which ran north-south and east-west in 6-mile giant squares. Within this framework the land was subdivided into square miles or sections, there in turn into quarter sections, and quarter-quarter sections, and so on, the

boundary lines running with the cardinal directions of the compass except in unusual circumstances. This pattern of rectangular survey has been imposed on the countryside for nearly all the United States west of the Appalachians. One need only look out of the airplane or car window to see how it dominates the landscape today. Moreover, later actions decreed that roads were typically built along the major boundary lines, often with each landowner donating half of the right-of-way to get a road. This pattern of road network has also persisted.

A system of Federal land records was established by the Northwest Ordinances, gradually developed and then slightly modified over the ensuing decades. The Federal records were definitive as to the original transfer of landownership from public to private hands. But the United States has never had a system of public guarantee of land titles; that has been left to private concerns. Today, in the public land States, land descriptions are typically tied to the Federal cadastral survey and land title begins with the original transfer. Later survey and title record are handled by private firms, with local recording of title transfers. A mixed system of land records has thus evolved.

DISPOSAL OF FEDERAL LAND

Land owned by the Federal Government has been disposed of in many different ways. Originally, the view was held that land could be developed for farms or various urban uses only if it belonged in private hands. Private ownership was very important to the man who invested his limited capital and labor in land development. Any suggestion of permanent public ownership of land was almost unthinkable at that time.

The chief method of disposing of land in the early-19th century was by sale, and this continued long after other methods had been adopted. The policy issues were over the minimum size of the units of sale; the speculators wanted large units in Washington, Philadelphia, New York, or any other relatively large seaboard city, while the frontiersmen wanted sales in frontier towns. Both wanted credit sales, particularly the settlers. Over the years, sales procedures shifted gradually in favor of the settlers, or at least in favor of men located on or near the frontier.

In 1862, after many delays, President Lincoln signed the Homestead Act. It was amended several times, the last major liberalization occurring in 1916. In return for free land, a man was expected to live on it for a required period. He was supposed to improve it by the cultivation of specified portions, to construct various improvements, notably a house, and to comply with simple administrative requirements.

Extensive areas of Federal land were granted to States, some of which were then given to railroad corporations. The State grants were for common schools, higher education, and other State institutions, and for internal improvements such as railroads, canals, and roads.

Grants were also made to improve swamp and overflowed land, but the Federal Government, unwilling to expend the necessary funds to improve such land, gave it to the States. As the States were generally even less able or willing to invest in land reclamation, land was sold to private investors. In this way some of the largest private holdings were built up.

Federal land disposal encouraged an enormous private drive and restlessness, which in a century or less carried settlement from the Atlantic seaboard to the Pacific coast and almost everywhere in between. It was this drive which built cities, cleared forests, made farms, and otherwise developed a vastly productive economic machine. It is doubtful if the times would have permitted a much more restrained and controlled transfer of land from public to private ownership. Moreover, in examining the flaws, one should not lose sight of the overall result; as Gates said:

> Yet with all the poorly drafted legislation, the mediocre and sometimes corrupt land officials, the constant effort of settlers, monied speculators and great land companies to engross land for the unearned increment they might extract from it, the Federal land system seems to have worked surprisingly well, if we may judge the results.[2]

PERMANENT FEDERAL LANDOWNERSHIP AND MANAGEMENT

By the third quarter of the 19th century, some of the excesses involved in the disposal of Federal lands, and in their subsequent use, led to demands by a few intellectuals that the whole process be changed. The cutting of vast forests, in particular with no concern or provision for their regeneration, greatly upset many thoughtful people. In the colonial and early nationhood stages, forests had seemed literally inexhaustible, and trees were often cut and burned where they lay, to clear the land for cropping. There seemed no need to protect the lands from fire or to secure regrowth of trees. An attitude, almost antiforest in character, grew up. But, as time went on, the large-scale cutting and destruction of trees alarmed those who could see an ultimate end to the virgin forests. Some farsighted leaders in the General Land Office, the Department of the Interior, and other Government offices repeatedly but vainly sought the authority and funds to eliminate timber trespass, enforce the land laws, and provide some reservation of Federal forested lands.

The first major permanent Federal land reservation was Yellowstone National Park, established in 1872. There had been earlier Federal land reservations; Cameron tells with much detail a curious example of the reservation of certain oaks in the Southeast to preserve them as building material for naval warships.[3] Among other reserved areas were certain mineral springs (Hot Springs, Ark., for instance, in 1832).

In Yellowstone, which was the first national park, the concept of a national park system was not created; that came much later in 1916 when the National

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[2] Paul W. Gates: *History of Public Land Law Development*, with a chapter on mineral development by Robert W. Swenson, prepared for the Public Land Law Review Commission, Government Printing Office, Washington, D.C., 1968.

[3] Jenks Cameron: *The Development of Governmental Forest Control in the United States*, The Johns Hopkins Press, Baltimore, 1928.

Park Service was established. Ise has described clearly the circumstances which made the establishment of Yellowstone National Park possible:[4]

> The establishment of Yellowstone was, of course, due partly to the efforts of a few of these idealists, several of them men of influence. Reservation was possible because most private interests were not looking so far west at this early date, for there were no railroads within hundreds of miles of Yellowstone.[5]

In other words, there was some support but little opposition because no one really cared about the timber and other resources of the park.

The first system for retaining permanent Federal land was the institution of national forests in 1891. A section was added to the general act which permitted the President to withdraw forested lands and prevent their disposal. Reservations of this kind were made rather slowly over the next decade, and there was no provision for their management. These early reservations were lands for which there was little or no demand. But later, many people became concerned at the "locking up" of such lands, and in 1897 legislation was passed which provided for their administration, including the authority to sell timber and other products therefrom.

Gifford Pinchot, "American's first forester," became a major figure in government when his personal friend, Theodore Roosevelt, became President. He persuaded Roosevelt to transfer the administration of forest reserves from the Department of the Interior to the Department of Agriculture. Pinchot became the first head of the new Forest Service. The seeds of interdepartmental rivalry and conflict over Federal land management were sown in this way, problems which have persisted until today.

The withdrawal of large areas of national forests aroused Congress to pass legislation forbidding the President to withdraw more lands in several Western States; Roosevelt signed the bill, but not before he withdrew another 16 million acres.[6] By 1905, the national forests had reached almost their present total acreage.

Other permanent Federal land reservations were made during the first third of the 20th century. Several national parks were established, each by specific legislation. A system of national monuments was authorized, and another of Federal wildlife refuges. Under American legal systems, game and birds are the property of the State, and their hunting is regulated by the States. To encourage greater protection in this and other countries, treaties on migratory waterfowl were made with Canada and countries to the south of the United States. Treaties, as instruments of Federal legal power, take precedence over State laws, so they provided a degree of protection to waterfowl which had been previously lacking.

In 1934, there remained nearly 200 million acres of "unreserved and unappropriated public domain" in the 48 States, and another 350 million acres in Alaska subject to disposal under a wide variety of land laws. All this land had watershed value, much of it with suspected mineral value as well. Over the decades, various proposals had been made for either disposition or management of such lands.

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[4] John Ise: *Our National Park Policy–A Critical History*, The Johns Hopkins Press, Baltimore, 1961, p. 17.

[5] Ise: *Our National Park Policy–A Critical History*.

[6] Samuel Trask Dana: *Forest and Range Policy–Its Development in the United States*, McGraw-Hill Book Co., New York, 1956, pp. 149-150.

In 1934 the Taylor Grazing Act was passed; it included authority to classify Federal lands and reject applications for their private acquisiton, provided for exchanges with private individuals and States, and above all provided for a system whereby grazing use of land could be regulated. The act was not perfect–in particular, its preamble spoke of "pending final disposal," which created an aura of uncertainty about the future. But it was an immense step forward, and has been the basis of Federal land management. There has been a great deal of other legislation with permanently reserved Federal lands, the details of which are much too involved to relate here.

One issue in Federal land management is that of multiple-versus-single use. The Forest Service has always made much of the fact that national forests were managed under multiple-use principles. The Bureau of Land Management has espoused the same concept, in recent years, for the lands under its jurisdiction. The National Park Service, on the other hand, has insisted that its lands were to be managed for the single purpose of reserving and making available for public use the great scenic and scientific resources of the national parks and other areas. In each case, the agency can point out that its basic legislation requires the kind of administration it had adopted, but the legislation in part reflects the philosophy and the advocacy of the agencies. The idea of multiple use is beguiling, especially to persons unfamiliar with natural resource administration: the land shall provide recreation, wildlife, watershed, timber production, grazing, and other outputs, according to its capabilities and to meet public demands. In fact, some of these uses are incompatible with others; in many instances, it is necessary to reserve the campground exclusively for recreation, or otherwise limit some uses in order to have desired uses at all. Under these circumstances, multiple use may become a mosaic of limited uses; the role of the manager, in coordinating such uses, is important and not always easy.

Although permanent reservation of Federal land may seem contrary to the development thrust of the American society and economy, really it is not. The reserved Federal lands have been used by private individuals and business firms. Livestock owned by ranchers have grazed on national forests and grazing districts, private firms have cut and processed timber harvested from Federal land, removed minerals from public lands, and so on. There has never been any significant amount of Federal resource exploitation on Federal lands. Thus, although in the colonial and early national periods the attitude was that landownership was necessary for economic development, it is far less prevalent today. Some harvesters of resources from Federal lands would probably prefer to own the lands, but others are glad to let a unit of government bear the ownership costs as long as they can buy the output from the lands.

In recent years there has been a great upswell in public interest in Federal land management. The national parks and forests have been used by millions of recreationists for many years, but most people have taken these lands and their management for granted. There have always been some well-informed and dedicated persons, of course, especially in the various conservation organizations. But the number of people who have become actively concerned has risen greatly and they have begun to exercise a marked influence on the management of these lands.

One of the more dramatic and extreme illustrations of their interest has been the citizen suit, which seeks to prevent public land management or use that some group sees as ill-advised, improper, or undesirable.

Although most attention has focused on Federal lands, in part because they are so important and extensive in area, public land management is not confined to the Federal Government. All States have owned large areas of land, at one time or another, and some still do. The Original Colonies owned land when the Union was formed; the new public land States were granted land by the Federal Government. Most States have managed their lands badly in the past; in the Western States, with which I am most familiar, no State has escaped political scandal at some time, primarily over land frauds and favoritism. Many States sold their lands for a pittance, often to persons with political influence, and many failed to obtain as great returns from their land as were possible. However, all this has changed, in most States to a great degree. Today, States usually manage their lands about as well as the Federal Government does; improvements are surely possible for each. The States vary today greatly in the extent of their Federal landownership; some States, such as Texas, Arizona, and New Mexico, own many millions of acres, while others such as Nevada and Kansas have only small remnants of their original grants left.

Counties and cities also own land. Much is parkland, but some is forest land (often available for recreation use), and some has other designations or principal uses. The management of these lands owned by local governments has had even less attention than the State-owned lands; there is reason to believe, or suspect, that much of this land is poorly administered. Certainly, some of it has been diverted to private or public uses for which it was not intended, and without adequate legislative authority–many local parks, in particular, have been invaded or diverted to other uses.

PUBLIC LANDOWNERSHIP IN CITY PLANNING AND IN CITY BUILDING

Although most attention about publicly owned land has been focused on federally owned land, and to a lesser extent on State-owned land, there have been important instances in which publicly owned land has played a major role in city planning and city building. Hundreds of towns and cities in the United States have developed from the Federal public domain, many laid out as townsites. For these, the General Land Office served as little more than a surveying subdivider who established streets, blocks, and lots on a rectangular, north-south east-west pattern, and as a sales agent who delivered title to successful bidders. As far as I am aware, there was never any serious thought given to city planning in the modern sense of the term.

At one time or another several American cities have owned a major part of their present-day centers, as Reps has shown.[7,8] A notable example was Washington, D.C. The new Capital was also a new city or "New Town"; although it adjoined Georgetown, its center was well to the eastward, and when it was designated as the new Capital the land was in private, largely agricultural, ownership. George Washington and Thomas Jefferson were largely responsible for public acquisition of much of the area, its planning and subdivision into blocks, squares, and lots. Plans were developed by a professional city planner, as far as there was such a person at the time, although he was not known by this title. Private landowners were required or encouraged to conform to the plan. Public landownership played a major role in this important city planning episode, which left a lasting mark upon the National Capital today.

Austin, which at the time was the capital of an independent country, Texas, was similarly planned. The site was publicly acquired by use of eminent domain powers. Like Washington, the original planning and development, which began in 1839, left a permanent mark upon the city. Between 1733 and 1856, when the supply of public land was exhausted, Savannah, Ga., was developed on its publicly owned land. A noteworthy feature of the Savannah experience was the planning and creation of open squares, around which lots were established and private homes built. More than 30 squares were originally established and Reps reports that all but one of them still persist. As development proceeded and previously established squares and lots were occupied, more squares were established and lots offered for sale. With landownership in the city, prospective settlers could be assured of building sites at reasonable prices, and there was no reason for the sprawl which characterizes modern cities.

At one time New York, Detroit, and San Francisco each owned substantial acres of land in what are their present-day city centers. None of these cities utilized their public lands for imaginative city planning and development, but sold them as rapidly as markets developed. Annapolis and Williamsburg are among the many cities and towns in the original colonies which were developed on publicly owned sites.

Historical precedent is not a sufficient ground for advocating future urban planning and building, of course, but historical experience is often the best way in which we can estimate the future effect of proposed actions. The American experience in city development based on public landownership has been insufficiently studied and publicized. As proposals for the public acquisition of sites for new towns and land for suburban expansion are advanced and debated (as I think they will certainly be in the next few decades), a careful review of past American experience with public landownership in developing cities would

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[7] John W. Reps: "The Future of American Planning–Requiem or Renascence," *Planning 1967*, American Society of Planning Officials, Chicago, 1967.

[8] John W. Reps: *The Making of Urban America–A History of City Planning in the United States*, Princeton University Press, Princeton, N.J., 1965.

seem eminently worthwhile. This does not in the least deny the value of looking at similar experience in other countries of the world.

LAND PLANNING AT THE FEDERAL LEVEL DURING THE 19TH CENTURY AND THE FIRST QUARTER OF THE 20TH CENTURY

This period of more than a century is often thought of as a relatively barren one as far as Federal involvement in land-use planning and research are concerned. But a great deal did happen during this time, even if indirectly.

The Federal Departments of Agriculture and the Interior were established at or near the middle of the 19th century. While their research efforts were small and not notable at first, perhaps, in time they developed great research capability on many aspects of natural resources use.

The land-grant colleges were established in this period also, encouraged by grants of public land. States without Federal public domain were given scrip for the same acreages of land as those with public domain. The States receiving scrip were required to sell it to private persons or corporations, which in turn selected the land for their private ownership. Some State scrip led to undesirable land practices, as improper as any that developed from land transferred from the public domain. Gates has explored one aspect of this situation.[9]

The actual grants of land were significant in starting the process of Federal aid to research and education (an important step), and because they represented important economic aids at the time. The Morrill Act of 1862 provided the original land grants for the establishment "of at least one college where the leading object shall be . . . to teach such branches of learning as are related to agriculture and the mechanic arts." The Hatch Act of 1887 provided Federal financial grants to the States for research in agriculture, which led to the creation of agricultural experiment stations. The Smith Lever Act of 1914 provided grants to the States for "agricultural extension" for adults.[10] Each of these basic programs was materially strengthened by later legislation.

The Federal Government's role in natural resource matters during the 19th and early-20th centuries was not limited to the stimulation and funding of education and research. One of its notable activities lay in the transportation field, particularly grants to railroads. Several of the major railroads were built with the financial help of public land grants. As a result of these grants, the Government was able to double the price of its land at public sales.

Although the whole idea of land grants to finance railroads had great advantages, there were some serious disadvantages. There were extensive frauds in the financing and construction of the rail lines and in the handling of land grants. Where land-grant sections promised to be low in value, the railroad would hire an individual to assert a homestead or some other claim to improve its worth. In this way some barren lands within the newly established national forests were traded out for highly valuable timber tracts at other locations.[11]

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[9] Paul W. Gates: *Wisconsin Pine Lands of Cornell University–A Study in Land Policy and Absentee Ownership*, Council University Press, Ithaca, N.Y., 1943.

[10] Charles E. Kellogg and David C. Knapp: *The College of Agriculture: Science in the Public Service*, McGraw-Hill Book Co., New York, 1966.

There was a widespread belief that railroads were not only vital to economic development, but sufficient to guarantee it (which they were not). The result was that large capital outlays were made to build them. But railroads in relatively unsettled country could not be immediately self-supporting, and the drive for railroad building, sponsored by the Government, became very strong. Public action reinforced private efforts, with the result that Federal aid was looked upon as essential.

The Federal Government's influence on roadbuilding was not very great until the time of the First World War. A program of building roads, largely financed by Federal grants, was then begun. The construction of throughways in cities began only after World War II.

In 1894 the Federal Government provided, in the Carey Act, for special grants of irrigable lands to States, which were then required to construct the necessary works to bring water to the land. In 1902 the Newlands Act provided for direct Federal construction of irrigation works, financed out of revenues received from sale of public lands. The revenues expected from the land sales and the acreage of irrigable lands were grossly overestimated, and the costs of irrigation construction were vastly underestimated. The Government began far more projects than it could feasibly push to completion and the whole program lagged badly.

Over the years, the Bureau of Reclamation has "developed" most of the water in the streams of the arid Western States; in the process, some agricultural communities have been developed and a lot of agricultural output produced. Without attempting an evaluation of the Federal irrigation program, one may simply note that it represents a major Federal activity in the natural resource field.

CITY PLANNING AND PUBLIC CONTROLS OVER PRIVATE LAND USE

In one sense, city planning is very old—Branch says it is 5,000 years old.[12] True enough, the location, layout, and growth of all cities has been planned to a degree, although often incrementally and without much thought about the whole, or end product. The oldest cities in the United States were planned in this sense; Reps has illustrated numerous city plans of the past centuries, including many cities that never got beyond the paper plan stage or that foundered as mere infants.[13] But city planning as a profession is relatively young; the American Institute of Planners was founded in 1917 (then called the American City Planning Institute). In no other kind of land use in the United States has the interest of the public gained more ascendancy over private rights in land than in urban land use, and city planning has been dominantly concerned with group versus private interests in land.

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[11] See Note 3, above.

[12] Melville C. Branch: *Comprehensive Urban Planning—A Selective Annotated Bibliography with Related Materials*, Sage Publications, Beverly Hills, Calif., 1970.

Scott argues that city planning in the United States has gone through several more-or-less clearly identifiable phases.[14] During the 1890's, the dominant focus was on political reform–drive the rascals out, stop graft, obtain honest and competent government, etc. This was also the period in which the city playgrounds came into existence, thus providing much of the early ancestry of the modern city park movement. Then came the "heyday of the city beautiful," during which time the McMillan Commission made its plans for Washington, and Daniel Burnham conceived grandiose ideas for Chicago, San Francisco, and other cities. In 1909 the first national conference on planning was held in Washington. The First World War and its immediately preceding years have been called "science and the city functional" by Scott. There was concern over planning and planning concepts, including various aspects of zoning (especially for the lower income groups).

The 1920's were the "age of business," with growing urbanism, skyscraper building on a scale larger than previously known, regional planning in Chicago and in New York, the development of the standard zoning act, and the *Euclid* case which upheld the legality of urban land zoning. The 1930's and the New Deal saw new and larger roles for planning generally, including city planning. With economic depression deepening, many controls over private land use were loosened to permit a greater variety of home-based activities. During World War II, city planning played a smaller role, but was involved, to some extent, in the planning of defense housing and activities.

Since World War II, city planning has widened and deepened its role in numerous ways. In his long history, briefly summarized here, Scott has shown how city planning gradually grew in numbers of practitioners, in sophistication of concepts and methods, and in influence in actual city growth. He identifies the chapters of his book with stages in growth of the profession, which shows a gradual evolvement and development.

Logically, a city plan should precede land-use zoning action; the plan is the objective, the zoning ordinance the method of its achievement. In practice, almost since land-use zoning began, the reverse has been true. The number of cities enacting zoning ordinances has been several times as many as the number of cities with anything that could, even charitably, be called a city plan. The reason for this emphasis on zoning and the gradual downgrading of planning is that many, perhaps most, supporters of zoning have looked upon it as a defensive tactic, a means of protecting land uses and property values. In passing, it may be noted that in Britain, planning *is* zoning; the planning process results in "planning permission" or its denial; there is no separate step of zoning, before or after planning.

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[13] See Note 8, above.

[14] Mel Scott: *American City Planning since 1890,* University of California Press, Berkeley and Los Angeles, 1969.

In essence, an urban land-use zoning action has three major aspects:

1. It rests upon some concept of a general public interest; some proposed or permitted land use is deemed to be in the general public interest, while that judged contrary to it is prohibited or refused. The public interest may be deficiently defined or neglected in various ways: the definition of the public interest may be weak, or a small segment of the public may be catered to as if it were the whole community. Nevertheless, unless some shred of a public interest can be claimed, there is no ethical reason for land-use zoning, and often no legal foundation either.

2. The land-use zoning ordinance restrains one or more private landowners from doing what he would otherwise do; unless a zoning ordinance does this, it is meaningless. A zoning ordinance which permitted every landowner to do anything and everything he chose would be ineffective and worthless.

3. The zoning action cannot prohibit all uses of the land; its owner must be able to do something with his land. Zoning may deprive him of the most profitable land use, if there is a compelling public interest, but it cannot deprive him of all economically viable land uses. If it does, this is public taking of land without compensation, and the courts have repeatedly overturned such zoning.

Those who first advocated and developed land-use zoning were sensitively aware of the effect these actions would have on their property values. Toll has related in some detail how land-use zoning began in New York.[15] In the years soon after 1900 the retail merchants, whose elegant stores had largely taken Fifth Avenue over from the great residences previously found there, were anxious to protect their shopping area from the intrusion of the garment trade. Land-use zoning was one device used by this group to protect their use of the area, and to preserve their property values. They also organized private boycotts of firms which attempted to invade the area, while at the same time helping them to find locations elsewhere. Toll argues that it was the success of the New York adoption of zoning, plus some sales effort by leading New Yorkers, which led literally hundreds of other cities and towns to adopt it. They were greatly helped by the formulation of a standard land-use zoning ordinance in the U.S. Department of Commerce, under the personal leadership of its Secretary, Herbert Hoover. All of this was done in spite of considerable doubts as to the legality of land-use zoning.

In 1926 the Supreme Court upheld the precedent-making case of *Euclid* vs. *Ambler Realty Co.*, which empowered municipalities to zone land for various uses and prevent discordant uses. This was not only a notable case, but a rather dramatic one, with numerous incidents and personalities; Toll's account of this case is absorbing to those interested in such matters. The Supreme Court of that period was as conservative as any in American history; it had refused both

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[15] Seymour I. Toll: *Zoned American*, Grossman Publishers, New York, 1969.

Federal and State Governments the power to regulate child labor, for instance. The Justice writing the decision, George Sutherland, was one of the more conservative members of that Court, yet he, and the majority of the Court, upheld land-use zoning. The simplified explanation is that they thought land-use zoning did not violate essential personal liberties and that it would have important effects in maintaining property values.

In the decade preceding the *Euclid* case, and in the years following it, many municipalities enacted zoning ordinances. While there was much talk that planning should precede zoning and that zoning ordinances were the means of carrying out plans, in fully three-fourths of the cases a zoning ordinance was enacted where there was no land-use plan to guide it.

In considering the role of land-use zoning in urban affairs, it is highly useful to distinguish two rather different situations: (1) built-up urban areas, where the purpose of zoning is to protect the area against discordant invading uses; (2) new areas, where land-use zoning is an attempt to confine development to the overall plans for the area. In the first role, land-use zoning has been fairly effective—that is, it has been a powerful tool in minimizing or in slowing down land-use change. This may be regarded as valuable, or undesirable, depending upon one's judgment of the desirability of change. In the developed areas land-use zoning has been, de facto, a powerful tool for racial and economic segregation. It has made the invasion of older residential areas difficult, though not impossible, by blacks, the poor, and even ethnic minorities. Under these circumstances, it has been the tool by which a public attitude, or the attitude of part of the public, could be made effective against private landownership; individual landowners were not perfectly free to do with their land whatever they might have wished. As such, this was an important episode or situation in the continual struggle between the rights and powers of the public and those of the individual, which we discussed briefly at the beginning of this paper.

In contrast, land-use zoning has had a much more limited effect in implementing land use for a developing suburb. Suburban cities and counties are often weak, politically, and rather easily manipulated by the local political machine or "courthouse gang." Although a master plan for the development of the area may be prepared, it has little political support. On the contrary, every local landowner wants freedom to sell his land at the best price he can get, for whatever use will bring the highest price, and he is prepared to fight master plan and zoning ordinance for his private advantage. Future residents of the area who might support a general plan are simply not yet there, and even newly arrived settlers may lack political organization to make their attitudes known. With intensive opposition on specific cases, and only lukewarm general support, the plan and zoning based on it fall before the political onslaught. The countervailing political pressures of the developed areas are missing, and there is no effective opposition to the developer. The problem is political, not legal.

As I contemplate the history of city planning and of urban land-use zoning, so briefly reviewed in this section, two major conclusions come through to me:

1. There is an urgent need for sharp, critical research on city planning and urban land-use zoning as it exists and operates today. Too much of what passes

for research has been primarily descriptive, a simple account which covers what seems to have happened, but does not really dig beneath the surface. The effect of land-use zoning upon land supply, and thus upon land prices and the resulting suburban development, have not really been studied in any depth. Land-use zoning has an efficiency effect, in the economic sense; this has had moderate research attention but far more is needed. Land-use planning and zoning have important distributive (or equity or welfare) effects, which have received very little research attention indeed. Even at their present scale, these tools should be critically reexamined; if there should be serious proposals to use them more extensively, or to try to put more teeth in them, then a better understanding of their operations is basic.

2. I am strongly convinced that if future cities and suburbs are to differ in any significant way from those of the past, additional tools for urban land-use control are essential. My choice is for relatively large-scale public purchases of land for subdivision and development, by sale or long lease to private developers; but other possibilities exist. The important point is that some substantial intellectual attention should be directed toward the creation and testing of new devices or methods. We cannot be content to limit ourselves to the inventions of the past.

THE NEW DEAL

When Franklin D. Roosevelt assumed the Presidency in March 1933, he inaugurated his New Deal. Tempting as it is to recall some of the more exciting aspects of those years, we shall simply say that this marked a watershed in the role of the Presidency, and of the Federal Government generally. Since then, the Federal Government has played, and will probably play, a vastly larger role in the affairs of the Nation than it had done up to that time. There were many aspects to the New Deal, as anyone who lived through it may remember, or as anyone who is interested may learn from reading. In the following sections we review only those parts which relate primarily to natural resource and urban planning. Such planning was inaugurated during Roosevelt's administration, on a scale hitherto unknown in the United States, and never fully maintained since then.

The Federal Government directly undertook some land development activities during the New Deal period. It built some towns–Norris, Tennessee, in the TVA area; Coulee Dam, in Washington; Boulder City, Nevada; it also financed and directed a few Greenbelt towns which were built near larger cities, and an agricultural colonization at Matanuska, Alaska. There were various forms of public works–the Civilian Conservation Corps, the Public Works Administration, the Works Progress Administration, and others which hired otherwise unemployed men to carry out numerous different projects, many of them on the land. In the cities, the Federal Government undertook to build public housing, and organize slum removal and rebuilding. In a great many ways, these specific development projects were not important–at least, they reached relatively few people and in the postwar years, when private development blossomed forth so vigorously, they were usually overlooked. But they did have their impact at the time, and were another demonstration that when necessary the power of the Federal Government could be effectively harnessed.

SPECIAL DISTRICTS

One aspect of the New Deal agricultural experience is, or may be, relevant to urban and suburban planning and development. This aspect concerns the soil conservation districts or, more generally, special districts with broad powers to carry out special programs. The earliest New Deal soil conservation program had dealt primarily with individual farmers. Leading figures in the Department of Agriculture, concerned that this was too slow and small in scale, turned to the soil conservation district as a mechanism for meeting and dealing with farmers. These men were much influenced by the irrigation districts of the West; such districts typically have large governmental powers for many activities. They may levy taxes, enter into repayment contracts with Federal agencies such as the Bureau of Reclamation, or construct dams and other works. A majority of landowners can form a district, bring other landowners into it (even against their will), and impose and collect taxes, if the taxes are part of an overall district program, even when no irrigation water is supplied.

Drainage districts in some parts of the country have similar powers. Weed-control districts in some States have enormous legal powers; they may control noxious weeds on a farmer's land, against his will, and make him pay for the operation. In irrigation, drainage, and weed-control districts, the respective program must be carried out for all the land in the district, if it is to be effective at all. Also, the majority must have the power to require that the minority participate. Such districts, initiated and run by farmers, are a very good example of pragmatism overriding philosophic scruples—the job had to be done, and individual rights had to give way.

The soil conservation districts have been much milder. The USDA drafted a model act. This did include the legal power to control private land use, but most State acts omitted this feature. In those States where land-use control was included, legal power has rarely been used and was rescinded in all the cases in which it was applied.

The soil conservation district is primarily an educational device, a means of the Federal Soil Conservation Service and the Federal-State-local extension service working with farmers on soil conservation matters. Most districts lack the power to levy taxes. Generally, however, they can own and operate earthmoving and other equipment, and some of them do. They have the power to accept grants, spend money, and enter into cooperative agreements. By now, virtually all cropland and the overwhelming majority of the country's grazing land has been included in districts. Originally conceived as strictly agricultural in their sphere of operations, some districts are now cautiously moving into resource matters generally—water developments, recreation, flood protection, etc., and some are beginning to broaden the base of their electorate from being purely agricultural to becoming more general. In some areas, city or county planners might well enter into cooperative arrangements with soil conservation districts.

But the "special district" idea might be applied to the problems of suburban growth and urban redevelopment.[16,17] There are now many special districts in urban and suburban areas for schools, mosquito control, parks, and other purposes.[18] While they are sometimes competent and have useful operating programs, they are usually primarily taxing bodies. As there is a ceiling on tax rates, or a reluctance by some local governmental units to raise taxes for some purposes, the special district has been a useful device for raising more revenue.[19] But the special district could be given very broad powers for development and redevelopment; it could have a diverse governing structure of various units of local government, and could include some private interests. While it would require some capital, its operations could be financially self-sustaining, if not profitable. The idea has great possibilities, as one contemplates the urban problems of the future and seeks new and more effective approaches to their solution.

NATIONAL RESOURCES PLANNING BOARD

The most ambitious effort of the New Deal, in the fields of natural resources, land, and planning, was undoubtedly the National Resources Planning Board (NRPB). This was a board of three men, appointed by the President and working directly with him, who provided advice on all subjects directly or indirectly connected with natural resources. The Board worked extensively with private businesses and with States and local government. However, its relationship with Congress was not close or happy, and was marked increasingly by suspicion and distrust on both sides. The Board alarmed some Members of Congress by appearing to make decisions, as well as making recommendations to the President. They feared it might become too powerful. In 1943, therefore, in some of the most sweeping language Congress has ever used, it abolished the Board and forbade the expenditure required to make it function.

The Board conceived its job in very wide-ranging terms; the subject matter of its studies and reports included virtually every major public issue of the

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[16] Henry Bain: *The Development District: A Governmental Institution for the Better Organization of the Urban Development Process in the Bi-County Region*, Working Paper No. 5, Washington Center for Metropolitan Studies, Washington, 1968.

[17] Marion Clawson: "Suburban Development Districts," *Journal of the American Institute of Planners*, May 1960.

[18] Committee for Economic Development: *Modernizing Local Government*, Committee for Economic Development, New York, 1966.

[19] Robert C. Wood and Vladimir V. Almendinger: *1400 Governments*, Harvard University Press, Cambridge, 1961.

time. Many of its reports were directly on natural resource subjects; others were on related issues, such as public works, and still others were on more general subjects. The studies employed the best data and often the most competent professional people then available. Many of the studies read remarkably well and are timely even today. In general, the viewpoint was an intellectual and liberal one.

NRPB was concerned with urban and metopolitan planning. Some of its studies were directed to national problems, such as population, employment, and welfare, which had great importance for urban areas. But others were more specifically directed to urban and metropolitan problems. It was concerned with regional growth, which often meant with metropolitan growth. The specific problems of cities were also a focus for its attention. In the urban field, as in others, many of the specific studies made by NRPB in the 1930's sound strangely current today; the basic problems remain, though perhaps they are somewhat modified.

Although the Congress effectively killed the National Resources Planning Board, some of its functions have been absorbed by other organizations, public and private. With the passage of the Employment Act of 1946, the Council of Economic Advisers was created to advise the President on economic matters. The kinds of analyses it makes, and its role as adviser to the President, have many similarities to the Board. Congressional committees have become better staffed, and the Congressional Research Service of the Library of Congress has served increasingly as a technical advisory arm to the Congress. Several Federal executive agencies have developed economic and policy advisory staffs, much more competent than those that existed during the New Deal days, perhaps in part because of the NRPB experience. Private agencies, such as the National Planning Association, the Committee for Economic Development, Brookings Institution, Resources for the Future, and others, have made economic analyses basic to national policy. NRPB's ideas and the approaches it developed surely did not all die with it.

It is difficult to know what lessons one may draw, with any confidence, from the NRPB experience.[20] It is easy to say: "NRPB was ahead of its time," and in a sense this is correct; but is not every planning agency, worth its salt, ahead of its time? Is there not an inherent conflict between conservatism and planning? Must a planning agency which is to survive be so careful, cautious, and unimaginative that it has limited value?

It is not difficult to point to some of the procedural or political shortcomings of the NRPB, as we have done here—in particular, its attempt to deal with Congress from a distance. Could it have survived if it had dealt differently with Congress? Or were the basic conflicts of purpose too serious.[21]

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[20] We are handicapped by the lack of a thorough and searching analysis of the NRPB experience; the discussion here draws on the various reports of the Board, some published analyses of it and some degree of personal knowledge of its operations. In total, however, they do not permit more than this rather superficial account of the Board.

[21] See Note 18.

We should remember that some persons, in public and in private life, feel their capacity to be influential on a personal basis is very much greater when a situation is fraught with disorder. The very objectives of the Board, which most intellectuals could endorse, aroused opposition from many interest groups.

NATURAL RESOURCE PLANNING IN THE POSTWAR QUARTER CENTURY

There has been a great deal of natural resource planning in the quarter century since World War II ended. It is impossible in a single paper to describe it all fully, but it seems essential to review its history briefly, if only to provide a common background for an overview of a concern for natural resources.

The establishment of the President's Materials Policy Commission, commonly known as the Paley Commission, was an event of great direct importance for natural resources. The great demand for raw materials of all kinds during the war had led to substantial increases in the relative prices of many raw materials. The Commission was set up to measure and evaluate the concern over the availability of natural resources for national needs. In addition to its comprehensive review of resource commodities, the Commission's work is notable for highlighting the idea that natural resources can be made available for use—at a cost. It demonstrated that absolute depletion or running out is unlikely; it will certainly not be encountered suddenly, for supply is elastic over very large volumes if additional costs can be borne. Unfortunately, this viewpoint has not penetrated the analysis of some recent prophets of doom, who predict sudden collapse from raw material depletion.

The Paley Commission report laid the ghost of early resource scarcity and emphasized the need for continuing study. One outgrowth of the Commission was the establishment of Resources for the Future, designed to provide the continuing review of natural resource problems in the United States. The success of the Paley Commission may well have been a major factor in the increasing use of special advisory commissions which have come to be a major part of the operations of the Federal Government. It is true that the Commission or advisory group is sometimes used as a stalling tactic, a device to argue to the public that something is being done when in fact it is not. It is also true that the reports of many groups or conferences have been ignored—and sometimes wisely so. But in the United States the Presidential and congressional commissions are beginning to exercise some of the functions that the Royal Commissions exercise in Britain.

The President's Water Resources Policy Commission was brought into being at about the same time as the Paley Commission. It took a comprehensive look at the water resources of the Nation. There have been a number of other commissions concerned with natural resources, two notable examples being: (1) the Outdoor Recreation Resources Review Commission and (2) the Public Land Law Review Commission. There have also been many White House conferences, including one on conservation when John F. Kennedy was President.

In addition to all these, there have been innumerable Presidential work groups, etc., some of which have been concerned with natural resources. In 1972, for instance, there exists a Presidential Panel on Timber and the Environment, whose function is to recommend policies which will increase timber supply and reduce the environmental impact of timber harvest. The National Commission on Urban Problems has investigated urban difficulties (see its report, *Building the American City*)[22] and set up a program of urban development, and the Kaiser Commission has dealt with housing.

To some extent these ad hoc commissions, etc., have substituted for the National Resources Planning Board. There are advantages and disadvantages to the ad hoc group, compared with the permanent organization. A temporary group may be able to attract valuable help in the form of experts who are particularly interested in some problem but would not accept a permanent Federal appointment. An ad hoc commission also has the major advantage, from the political viewpoint, that if its work is unsatisfactory or embarrassing, it simply fades out of existence, whereas the liquidation of a permanent organization is often difficult. However, the tooling up is often a problem for the ad hoc commission, so it may find difficulty in attracting able professionals.

Although the great advantage of a permanent organization is that it builds up information, and its members acquire experience which can be useful in tackling new problems, there has been no pressure for the reestablishment of a comprehensive Federal planning organization in the past quarter century. For better or worse, each President and each Congress has preferred to work with the ad hoc commissions or other similar groups.

RIVER BASIN PLANNING

A special form of resource planning has been "comprehensive" river basin planning. By the middle 1930's, there were three major Federal agencies building big dams–TVA, the Bureau of Reclamation, and the Army Corps of Engineers. The Department of the Interior established departmental river basin coordinating agencies by the end of the war, or shortly thereafter, and interdepartmental committees or agencies were established later for most major water basins. Although several departments and agencies have been represented, these have largely been dominated by the Corps of Engineers and, in the West, by the Bureau of Reclamation.

California has had a water planning and a water-management construction program since the war on a scale and competence which has made it an almost equal rival of the two powerful Federal agencies. Texas also prepared plans for a very large-scale State water program, but efforts to fund it were rejected by voters. Each of these State programs have been on a scale unimaginable for State action a few years ago–professedly for $2 to $3 billion–and have included water development projects which were enormously costly in relation to estimated benefits.

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[22] U.S. National Commission on Urban Problems: *Building the American City*, Government Printing Office, Washington, D.C., 1969.

Other States have engaged in water planning, though none on so costly a scale as these two. One privately originated plan, the North American Water and Power Alliance (NAWAPA), proposes to move large quantities of water from western Canada down into the western United States in an international, interstate, and interprovince power, navigation, and irrigation scheme. The very size, novelty, and imaginative features of this plan have attracted much interest. It has also attracted a great deal of opposition; every region opposes "export" of its water, even when it has no plan for using the water itself.

The primary focus of these water planning efforts is, obviously, water resources and their use, but other resources must necessarily be included in the same planning. Most studies have included surveys (of varying detail) of possible dam, power station, and canal locations, but in many instances they have also included land-use surveys and land classifications. Such studies have also typically included more general social and economic planning, such as population, income, employment, energy consumption, transportation, etc.

There has been some interesting experimentation and maneuvering of the administrative and political relationships in this planning and the subsequent hoped-for water development. In California, for instance, there has been a fascinating three-power struggle between the Corps of Engineers, the Bureau of Reclamation, and the State of California. Each seeks voter or political support, emphasizes its own competence, and aims to develop the same water resources and damsites as one or both of its rivals. Also, each of these contenders is afraid that the other two might strike a bargain to its disadvantage; on a State scale, it is a replica of the three-power rivalry of the United States, the Soviet Union, and Communist China!

On the Delaware River an interstate compact has provided for a commission on which the Federal Government and the States of New York, Pennsylvania, New Jersey, and Delaware have "equal" powers, at least as far as formal voting rights are concerned. Although the commission cannot, of course, compel the United States to expend funds, it may have enough legal and political strength to require that available Federal funds be expended on its plans. This unique State-Federal partnership led some students of government to believe this might be an innovation comparable in imagination to that of the Tennessee Valley Authority; subsequent events suggest, however, that the commission is just another commission.

FEDERAL GRANTS-IN-AID FOR PLANNING

Although there has been no revival of a national planning board, one aspect of the old NRPB has been very much in evidence since World War II. The Federal Government has made extensive grants to States, counties, and cities in order that they may engage in planning, often called "comprehensive" planning. Such grants have been generally on a project basis; that is, they have been for specific purposes or plans for defined time periods, rather than general planning support grants on a permanent or indefinite basis. Although the Federal agencies were not committed at the beginning to such continued support, grants have generally been available year after year, so that in fact many urban planning organizations have been supported to a major degree over many years by this means. Two of the chief sources of the Federal planning grants have been section 701 of the Housing Act of 1954, as amended, and transportation planning grants under the Federal-Aid Highway Act of 1962.

Planning grants were made under these programs to established State or local planning units upon application by the latter. There were no "formula" grants, wherein a unit of government got a grant by application of law, regardless of approval by the Federal granting agency. The planning could be concerned primarily with housing or transportation (chiefly highways) or it could be general. Whatever its primary focus, it could hardly ignore other aspects of the total urban scene, so the distinction between a specialized and a general planning exercise was in practice far from clear.

In any case, the planning effort was likely to start with a land-use inventory which determined how the land in the planning area was presently being used. These land-use inventories were made in many different ways, with results which I will discuss. Information was usually assembled on past trends and present conditions of the population, sometimes by age and other groupings, and also on employment and other socioeconomic factors. Often a survey was made of traffic flows and patterns—uniformly so, for transportation studies. Then projections to some future date were made of some or all of these factors, usually including expected traffic flows.

Although the planning studies made under these Federal grant programs were similar in general outlines, they differed greatly in detail and sophistication of analysis. By and large, the degree of detail and sophistication increased over time, and was greatly aided by the computer and other technology which was developing during these years. By now, almost every metropolitan area or center and many smaller cities has had some kind of a city or metropolitan plan made during the past quarter century. By far the greatest proportion of them have been paid for, at least in part, with Federal funds.

Each such city or metropolitan planning study has stood its own base. There has been very little coordination from the Federal granting agencies; applications had to be approved, and there was some checking to insure that funds were spent for the purposes requested, but the techniques of data collection, data analysis, and planmaking were those worked out by the city or other unit concerned. Such local units did, of course, learn from one another and borrow ideas where they could, but this was their affair, not that of the Federal agencies. In January 1965, the Urban Renewal Administration and the Bureau of Public Roads published *Standard Land Use Coding Manual,*[23] in an attempt to bring some uniformity in the local land-use studies financed by grants from these two agencies. The procedures of this *Manual* were not made obligatory on grantees, however, and the initial effort to provide a technical assistance service to cities and local government, and to aid them in adoption of this uniform system, was quickly abandoned.

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[23] Urban Renewal Administration and Bureau of Public Roads: *Standard Land Use Coding Manual*, Government Printing Office, Washington, 1965.

As might be expected when scores of cities and units of local government use definitions and procedures of their own choosing in conducting land-use and other surveys, the results were highly variable. It was not only that one city might collect a lot of detail on industrial land use while another lumped all industry into a single category, or that one might survey recreational land use in detail while another did not; the boundaries of the major use classes were often not the same, thus reducing the comparability of data which purported to be the same. For instance, when the Department of Commerce launched (and the Department of Transportation completed) its Northeastern Corridor Transportation Project, it sought and obtained land-use information from several score of counties. But the use categories were so variable that only three broad classes could be summarized: residential, commercial, and industrial. An analysis of these data raises strong suspicion that even these categories were not comparable,[24] and any insights that could have been gained from comparison of different geographic areas were impossible.

Although a number of planning grants were made to many units of local government and more than one set of plans was made during the postwar years, very few, if any, have had facilities for prompt updating or keeping the data current. The land-use surveys have been, typically, one-shot affairs. When new surveys were made, they may or may not have used the same land-use categories employed initially; if they were not, the historical comparisons for the area were impossible, difficult, or lacking in precision.

The land-use surveys, other data collection efforts, and the specialized or general plans of local government have not been—could not be—summarized into any kind of a *national* land use or other resource use picture. Many local efforts, each guided by local standards, do not add up to a national picture, no matter how much money has been provided by the Federal Government or how competently each local effort was carried out. It is interesting to speculate if the situation would have been any different if the National Resources Planning Board had continued, or if any other comprehensive planning organization had taken its place. There surely would have been a powerful incentive for such an agency to seek local data collection and planning which could have national usefulness. Yet it is also probable that units of local government would have resisted any Federal direction imposed on their activities, and that they would have had substantial political support in this position. The Federal agencies might have led, they could not have driven; in practice, they did not try either to drive or to lead.

The plans produced by this process were often a necessity for obtaining Federal grants of various kinds. For instance, the 1962 Highway Act provided that no Federal highway grant-in-aid funds should be spent in any city of 50,000 or more after July 1, 1965, unless there were a "continuing comprehensive transportation planning process carried on cooperatively by States and local communities" in the area. Urban removal and some other housing grants have depended upon some kind of a "comprehensive" plan also. These requirements, plus the opportunity for Federal grants to defray a large share of the planning cost, were obviously a powerful incentive to units of local government to collect data and make plans. They were not necessarily so influential in getting the plans actually followed by these same units of local government. Many plans have been only "paper;" something nice to show voters, Federal officials, and strangers, but not to be taken seriously if they threatened the pet project of some local group, business interest, or politician.

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[24] Marion Clawson: *Suburban Land Conversion in the United States: An Economic and Governmental Process*, The Johns Hopkins Press, Baltimore, 1971.

The Federal Government has had several other grant-in-aid programs in the postwar years which have required "comprehensive" planning, as a condition of the grants. There have been various water development programs, especially in rural and smalltown areas, grants for sewerage systems, urban and suburban open space land acquisition, and recreation land acquisition and development.

The terms and conditions of these various programs and the changes which have taken place over the years are too complex and detailed to be described in this paper. The amount of the grants, while perhaps far less than the State or local governments would like to think is their due, has been sufficient to make it worthwhile for every one of them to seek grants for desired projects for which it could qualify. While there has been much discussion about the diverse nature of these grants and the lack of coordination among the Federal agencies making them, their very diversity has enabled States and local governments to shop around and, to some extent, play one Federal agency against another. It has been a fertile field for the imaginative governmental entrepreneur; there was money to be had, if one could find it and get his hands on it.

The recreation planning program, barely mentioned above, deserves a further word. One outcome of the Outdoor Recreation Resources Review Commission study was the creation of a Land and Water Conservation Fund. Although the proportion going to Federal agencies, compared with that going to the States, has varied somewhat from year to year, in general the funds have been divided about equally. The sources of these funds, and their amounts, has also varied considerably, but have now reached about $300 million annually. These funds can be used by States for projects of units of local government; usually the Federal funds must be matched by State or local funds, or both in combination. For our purposes, a major fact is that the States, to get the grants, must submit "comprehensive" statewide recreation plans for a 5-year period. The State plans have varied enormously in detail and in competence; no State has been refused "its share" of the funds because of deficient plans, although some funds have been held up for a time and some States have been encouraged or admonished to prepare better plans. A comprehensive recreation and park plan for State agencies can hardly ignore similar plans by Federal, local government, and private increases. Nor can it ignore demographic, economic, social, and other trends within the state.

By and large, the planning done to qualify for these Federal grants has not been done by professional planners as such but by specialists in the various fields. The former may have missed an opportunity to use and be suitably rewarded for their skills by their limited participation in this type of planning. Most professional planners are poorly informed on many of the issues of sewerage or park systems, but they should be able to contribute a better analysis of the basic demographic, economic, and social background than the specialized planners for these functions can. It would seem that fruitful partnerships could be established; while there have been some, the missed opportunities seem considerable.

In mid-1972 it seems probable that some form of national land-use planning legislation will become law before long. Until an act is passed, it is fruitless to attempt an analysis of its probable operation. Pending bills, while differing in important respects, would make the States the chief planning agencies, with financial help from the Federal Government. They would also impose some sort of penalty system on States which did not carry out land-use planning. Many important and difficult issues will have to be worked out in operation, regardless of the terms of the act.

Public attitudes toward land planning have certainly changed since the National Resources Planning Board and United States Department of Agriculture rural planning days. However, general but mild public approval for land planning will probably not be enough to provide an adequate political base when the inevitable happens and some planning effort steps on the toes of an influential person or group. All we can say is that the passage of national land planning legislation, assuming it comes, will surely offer planners opportunities and challenges.

ENVIRONMENTAL IMPACT STATEMENTS

The rising tide of public interest in environmental matters generally should now be clear to the reader. Some of the shallower popular manifestations of that interest seem clearly to have peaked and receded, and many environmental issues are more difficult to resolve than we optimistically thought a couple of years ago. Environmental problems, however, are indeed worthy of thought and action at the highest national levels, not only now, but forever.

One specific manifestation of national interest was the National Environmental Policy Act of 1969. This act has many important features, but it is section 102, requiring an "environmental impact statement," which merits our particular attention for this paper. Such a statement must be prepared by "responsible officials" in all Federal agencies before they take "major actions" which "significantly affect the quality of the human environment." Except as required under State law, State agencies must file such statements only when Federal involvement (funds, permits, grants, etc.) is included and only if the State prepared the initial proposals. They are required by industry only when a Federal license or permit is required for the proposed action. It is easy to see ow the broad language of the act (in quotes, above) is subject to more than one interpretation; the courts are now struggling to give the act more specific meaning. Is a single timber sale from a national forest a "major action," or should "major" only refer to a roadbuilding plan for a watershed or some other relatively large area? There are many other examples.

The act also created a Council on Environmental Quality, which has attempted to provide guidelines to the foregoing questions and many others which are suggested by the broad language of the legislation. Federal agencies are required to submit environmental impact statements in draft; these are then open for comment by other agencies and the public. If there is sufficient interest or objection, a public hearing may be required, and then the initiating agency submits a final impact statement. No action may be taken on the proposed project by the agency concerned until at least 90 days after the draft statement has been available to the public, nor within 30 days after the final statement. The act does not give either the public, the Council on Environmental Quality, or any other unit of Government new authority to stop any agency action; it requires only the environmental impact statements, the public review, and the agency response. After that the agency may proceed, irrespective of criticism, if it feels it has the requisite authority, funds, and political support. Actions may be stopped by court action, as described below.

Environmental impact statements vary greatly in detail, accuracy, and even relevance. They are required to explore the environmental impact of the proposed action, any unavoidable adverse effects, any alternative ways of meeting the same general objectives, the relationship of short-term uses and long-term productivity, and any irreversible and irretrievable commitments of resources. Every aspect of these requirements, however, can be treated in varying detail and in varying degrees of sophistication.

The sheer volume of environmental impact statements greatly reduces the impact of any one. In the first 2 years of the act's operation, about 2,000 draft statements and about 1,000 final statements were filed with the Council, and over 100 new draft statements are received monthly. The Council has lacked the manpower to review all these statements carefully; their review by other Federal agencies takes a great deal of time, and it is probably impossible for any private interest group to review them all. Nevertheless, these statements have acquired great importance, and are likely to acquire more in time. The very fact that an agency is obliged to prepare statements which are then open to public challenge is enormously important; an agency never knows, in advance, when a particular statement will become an issue of public debate and controversy, so a wise agency will prepare every statement on the assumption that it will, in fact, become the center of public controversy. Preparation and review of environmental impact statements has clearly resulted in further delays in Federal action—often characterized in the past as full of delays and obstructions. The environmental statements, far from oiling the wheels of Government action, have served a braking role, and they obviously cost money to prepare and to review. As time goes on, and statements more nearly conform to a common pattern—and perhaps as the public goes to sleep again—preparation and review of such statements may become less time consuming. One can endorse the idea of greater environmental concern, and more careful governmental programs to meet environmental problems, without necessarily agreeing that the present environmental impact statements are the most efficient way of exercising this public concern.

CITIZEN ACTION

Partly independent of this problem, and partly in conjunction with it, has been the rise in the past decade of the citizen or class-action lawsuit. Existent citizens groups, or those formed for the purpose, have entered suit to stop some proposed private or public program or action to which they are opposed. Some such suits have been successful, or at least temporarily so, others have been rejected by the courts and many others are pending. Many citizen groups have made substantial progress in their efforts to attain standing to sue; courts have been taking a more liberal attitude towards those who have no direct or personal financial interest in the proposed action or the outcome of the suit. Various conservation groups are making great efforts to raise funds to enter such suits and make them more successful.

One may endorse the general idea that public agency and private firm activities should take greater account of the environmental impacts of their proposed actions and the general public welfare. At the same time one cannot be fully enthusiastic about the type of lawsuits that have been promoted. At best, they constitute a further obstacle to efficient public action–a necessary one, perhaps, but nevertheless a costly one. If the plaintiffs' and defendants' energy expended on some suits could be directed toward constructive solutions, possibly more might be gained. Moreover, the adversary court suit is not a good mechanism for seeking and finding the socially most constructive solutions to difficult problems. So far, all the suits have been by those objecting to some proposed public or private action: I would not be surprised to see some "suer group" sued by some other interests on some resource issue. Suits which hold up some action surely impose costs on the proponents of such action; if the suers lose, should they be immune from suits to collect costs, not only of court action but of delay? I think it is clear that all the ramifications of the citizen or class-action suit are not yet understood and that the ultimate role of such suits has yet to be determined.

Although the environmental impact statements are variable, they are a rich mine of information about natural resource and development–a mine which has hardly been touched by the professional planners and the research community. Preparation of these environmental impact statements is surely a form of resource analysis and planning; by and large, they have been prepared by people whose training was not in planning and who were not considered as planners–engineers, foresters, and many others.

CONCLUDING COMMENT

The experiences of the postwar years amply demonstrate the shifting balance of power over land between private and public interests. A public interest in the use of public and private land is, repeatedly, asserted. In many instances, the asserted public interest is really the interest of a different private group. Many persons who do not own or rent land, or use it personally, nevertheless have asserted a right to influence or control its use. Let there be a proposal to raze an old building which is alleged to have historic or architectural or other special value, and see how many individuals come rushing forward to prevent such a razing. They assert all kinds of general public interest—which often means only that they wish to avoid any expense for maintaining a building they do not own and have never used, but feel should be part of their general environment.

The rising public interest in land use may take many different forms. It may be no more than a general support of the planning process: a desire to see an orderly land use and development of public programs affecting land. Or it may be directed to some specific issue, as in the illustration of the razing of an old building. And, of course, innumerable intermediate situations exist.

The individual landowner is less and less able to do precisely as he pleases with his land. Others must be consulted, maybe pacified, and increasingly the profitable use of an individual's land must depend on what others do with theirs, or what the public does to provide various group facilities. The necessity to consult with others, and to accommodate to their demands, takes time and money. This constitutes a definite, though perhaps unavoidable, added friction in the economic machine.

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4. Outdoor Recreation Resources Review Commission: *Outdoor Recreation for America: The Report of the Commission to the President and to the Congress*, Government Printing Office, Washington, 1962.
5. Malcolm Rohrbough: *The Land Office Business—The Settlement and Administration of American Public Lands, 1789-1837*, Oxford University Press, New York, 1968.
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PART III

THE SOCIAL, ECONOMIC, AND NATURAL ENVIRONMENTAL FACTORS IMPORTANT TO ENVIRONMENTAL LAND-USE PLANNING

Chapter 3

THE FUTURE OF THE URBAN HABITAT

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THE URBAN FIELD AS HUMAN HABITAT

My purpose in this paper is to draw attention to a new form of the human habitat that I believe to be emerging. This form, which I shall call the urban field, is more extensive in its spatial dimensions than any concept we have previously had of the city.[1] Planners refer to it disparagingly as peripheral sprawl, and public policy has roundly ignored it. Yet the urban field continues to expand and develop. More than 90 percent of the American people are residing within its boundaries. The urban field has become our home. We are born there, we live there, we are buried there.

The urban field may be described as a vast multicentered region having relatively low density, whose form evolves from a finely articulated network of social and economic linkages. Its many centers are set in large areas of open space, of which much is given over to agricultural and recreational use. The core city from which the urban field evolved is beginning to lose its traditional dominance: it is becoming merely one of many specialized centers in a region.

The urban field thus represents the latest in a series of continually expanding concepts of the city. Beginning with the urban nucleus of preindustrial society, the city steadily grew as a physical entity, encroaching upon existing urban places on its periphery and incorporating them into its physical structure. The urbanized area—meaning the continuously built-up area of the city—eventually gave place to the city region as an area whose economy was closely integrated with the old center.[2] But this enlarged region, in turn, yielded to the urban field which differs from preceding concepts of the city by stressing [illegible] uses made by urban populations of their environment. Spatially constrain[illegible] distance to the core from which it grew, it is also the physically more ext[illegible] concept.

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[1] The concept of the urban field was first proposed by the author, in collaboration with John Miller, in "The Urban Field," *Journal of the American Institute of Planners*, vol. 31, No. 4 (Nov. 1965), pp. 312-320. For a related discussion, see Kevin Lynch, "The Pattern of the Metropolis," in William H. Leahy, David L. McKee, and Robert Dean, eds., *Urban Economics*. New York: The Free Press, 1970, ch. 2.

[2] John Friedmann, "The Concept of a Planning Region," *Land Economics*, vol. 32, No. 1 (Feb. 1956), pp. 1-13. A technical discussion of these concepts is found in Kingsley Davis, *World Urbanization 1950-1970*. Vol. I: Data for Cities, Countries, and Regions. Population Monograph Series, No. 4. Institute of International Studies, University of California, Berkeley, 1969, pp. 18-24.

The urban field may be regarded as the basic territorial unit of post-industrial society.[3] At the present stage of our knowledge, a formal definition of the urban field is a hazardous undertaking. The following three-dimensional definition is proposed as a basis for further discussion:

1. as a *territorial subsystem of society,* the urban field is characterized by a spatially extended pattern of functional interaction and a multicentric form of spatial organization. Its outer limits are defined by periodic recreational uses on part of its resident population;

2. as a *density configuration,* the urban field is characterized by the spatial dispersion of its population into high density activity clusters, surrounded by low-density open spaces that are related to each other by a complex network of transport, communication, and energy flows;

3. as a *physical environment,* the urban field is characterized by permanent as well as periodic uses of land-extensive environmental resources for activities such as outdoor recreation, intermixed with spatially segregated but permanent and land-intensive uses for residential, economic, cultural, and political activity.

This vast new urban complex can no longer be visualized as a whole. Nor can it be directly experienced except in its parts and sequentially. The central city which gave birth to it no longer dominates its life, yet the field which surrounds the mother city is held together by a tight pattern of interconnected activities and land uses. If we center the urban field on a city of intermediate metropolitan size, its physical reach would extend for roughly 2 hours' driving distance from this center—and less where adjacent urban fields contain it—encompassing an area of as much as 9,000 to 15,000 square miles, or roughly two to three times the size of Connecticut. By this measure, the 100-odd urban fields we have today would cover approximately one-third of the total land surface of the continental United States.[4] Most of our lives unfold within their boundaries. No longer drawn to a single center of commerce, industry, and political power, we use the urban field by traveling along its many arteries in all directions. Suburban fingers reach out into it; second and mobile home areas spring up along its major throughways and on its outer fringes; its open spaces—lakeshores, beaches, and forests—are used intensively for recreation. The total population of the urban field may be as small as half a million and as large as 20.[5]

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[3] For a critical evaluation of current metropolitan concepts, see Brian J. L. Berry, *Metropolitan Area Definition: A Re-Evaluation of Concept and Statistical Practice,* U.S. Department of Commerce, Bureau of the Census, July 1969 (revised).

[4] Urban fields begin to be significant features in settlement geography for core areas of about 300,000 population. Starting with this size, the "fringe" of settlements begins to be important as shown in the following table for data taken from the 1960 Census of

In many parts of the country, urban fields are clustered into "galaxies" of which Megalopolis along the northeastern seaboard of the United States was the first to be recognized. A recent study identifies 12 emerging urban galaxies. Using a more conservative criterion than the one I am proposing here, the author estimates that by the year 2000 fully 70 percent of the American people will come to live in them. Their population densities will range from a low of 250 per square mile to over 1,000, covering an area that is only 10 percent of the Nation. The remaining 90 percent of the land area is projected to a density of only 33 people per square mile.[6]

Population. Although this table pertains only to SMSA populations, the proportion of the "fringe" population shown is indicative of what we are likely to find in the urban field.

PROPORTION OF POPULATION IN THE "FRINGE" OF UNITED STATES "URBANIZED AREAS" AND "STANDARD METROPOLITAN STATISTICAL AREAS," BY SIZE OF AREA

Population of the UA or SMSA	Percent of Population in Fringe	
	Urbanized Areas	Metropolitan Areas
50,000 to 75,000	8.8	12.7
75,000 to 100,000	18.7	27.5
100,000 to 250,000	28.5	43.2
250,000 to 500,000	36.2	51.0
500,000 to 1,000,000	36.5	47.3
1,000,000 to 3,000,000	51.5	57.4
3,000,000+	43.3	43.9

Source: Kingsley Davis, *op. cit.*, Table 21.

[5] The recognition that a radically new settlement pattern is emerging in the United States is coming to be recognized in such works as Wilfred Owen's *The Accessible City* (Washington, D.C.: The Brookings Institution, 1972). Owen writes (p. 11):

> Between 1960 and 1970, metropolitan area growth was almost all in suburbs–26 percent, but only 5 percent in central cities. In 1970 the suburbs contained 74 million people, 19 million more than in 1960; the central cities contained 62 million, an increase of less than 3 million. And 67 million lived outside metropolitan areas.
>
> Thus, approximately 140 million Americans already live in relatively low-density areas–in the suburbs, in small cities, and in the countryside. Under the influence of the automobile, the giant wave of migration from farm to city has reversed itself and people are pouring back into the country to create new patterns of suburbanization and dispersal.

[6] Jerome P. Pickard, "Trends and Projections of Future Population Growth in the United States, with Special Data on Large Urban Regions and Major Metropolitan Areas, for the Period 1970-2000," presented to the Ad Hoc Subcommittee on Urban Growth, Committee on Banking and Currency, U.S. House of Representatives, July 22, 1969 See also Jerome P. Pickard, *Dimensions of Metropolitanism*. Research Monograph 14. Washington, D.C.: The Urban Land Institute, 1967.

This expansion of our living space into the physical peripheries of large-core cities is occurring at a time when the total population growth rate of the country is declining, and the excess supply of rural labor has all but vanished.[7] Henceforth, rural populations will amount to only a small and rapidly dwindling fraction of the total migrant stream.[8] Adding the growth of population over all urban fields, we find it to be nearly equal to the average population increase in the Nation. It follows, if we discount immigration from abroad, that population gains above the average which are scored by any urban field will necessarily imply a loss of population for some other field.[9] This conclusion is strengthened, if we recall that a substantial proportion of well-to-do commercial farmers are also residents of urban fields. The remnants of the population who live on relatively unproductive land, in villages and towns of the intermetropolitan periphery, beyond the reach of urban fields, will either move to them or else grow old in museums of a way of life no longer known to most of us.

My purpose here is to take a closer look at the structural changes occurring inside this new form of the human habitat. As people move farther and farther away from the mother city, they do not leave the urban field behind; they merely extend its radius until they push against the edges of adjacent fields. And there may come a time, not far away, when we shall suddenly become aware that escape from pervasive urbanism is no longer possible. Already the majority of those in search of open space are carrying their home amenities with them, like snails. As Al Martinez of the *Los Angeles Times* reported it:[10]

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[7] In 1971, the natural rate of increase of the American population was down to 0.81 percent, but foreign immigration raised the net population increase to 1.2 percent. At the same time, farm population was only 4.8 percent of the total, or 9.7 million in 1970. (*Report on National Growth 1972.* Washington, D.C.: Government Printing Office, 1972, ch. 1.) Agricultural labor force, on the other hand, was only 3.8 million in 1968 and has been projected to 2.8 million by 1980. (U.S. Department of Labor, Bureau of Labor Statistics, *Patterns of U.S. Economic Growth.* Washington, D.C.: Government Printing Office, 1970.)

[8] Paul J. Schwind, *Migration and Regional Development in the United States, 1950-1960.* Research Paper No. 133. The University of Chicago, Department of Geography.

[9] This is an extrapolation of an argument developed by William Alonso. According to Alonso:

> Migration from non-metropolitan areas and from abroad plays a shrinking role in metropolitan growth. The rate of migration to all metropolitan areas has declined from 21 per 1000 inhabitants per year in the first decade of the century to less than 5 in 1960-1965. Migration's share of total metropolitan growth declined over this same period from 70 percent to less than 30 percent, and it is now apparently about 20 percent. In other words, the intermetropolitan population system has become more closed, and changes in the structure will accordingly respond more to its internal dynamics and less to external forces.

("The System of Intermetropolitan Population Flows," Working Paper No. 155, Institute of Urban and Regional Development, University of California, Berkeley, Aug. 1971, p. 2.)

> A bumper-to-bumper stream of campers, trucks, motor homes, vans and trailers is rolling out of the cities into the woods, but do not let the happy hum of their engines fool you. The open road is closing to the outdoorsmen on wheels . . . There are 4.5 million of them on the nation's highways now . . . and the figure is expected to more than double before the decade is out.

Some of their vehicles are 28-foot cruisers equipped with stereo, air conditioning, forced-air furnaces, television, water purifiers, electrical power plants, private bedrooms, and other "essentials" of urban life. The annual rate of output of these and similar, if more modest, units is nearly 500,000, and the rate is accelerating.

It is quite likely that the urban field has already reached its maximum physical dimensions which are set, in part, by the willingness of people to spend part of their waking hours in travel. Most people are unwilling to spend more than 2 hours out of a 16-hour day in the journey to work, and 2 hours of commuting time would amount to a one-way travel distance of 40 to 50 miles. This is the maximum distance. Average time spent in work trips varies from 68 minutes in the New York region to about 43 minutes in smaller metropolitan areas. This is equivalent to a one-way travel distance of between 15 and 25 miles. It is important to emphasize, however, that the journey to work is no longer exclusively to central employment locations. The gradual migration of industries and increasingly also of nonmanufacturing business concerns into suburban and exurban locations implies that people can reside further and further from core cities without extending their journey to work. This phenomenon, in fact, helps account for the emergence of urban fields whose inhabitants look to jobs in one direction and to outdoor recreation in another. The Eastern Massachusetts Regional Planning Project, for instance, covers an area of 30-mile radius measured from the center of Boston. This includes the bulk of the Boston region's labor market area, but it does not include the increasingly important recreation and second-home communities in the western part of the State and in sections of New Hampshire and Vermont. By the present definition, these areas would be considered part of Boston's urban field.[11] Weekend commuting to second-home communities and prepared recreational areas would extend the boundaries to between 75 and 100 miles. Given the spacing of potential core cities, this would appear to be the furthest reach of the urban field. In many places, especially the eastern United States, distances will be less than this because urban fields are bounded there by other urban fields at higher densities than elsewhere.[12]

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[10] "Ecologists Edgy Over Boom in Motor Homes," *Los Angeles Times* (Feb. 28, 1972).

[11] James M. Morgan et al., *Productive Americans.* Ann Arbor, University of Michigan Institute for Social Research, Research Center Monograph 42, 1966, table S-3, p. 80); Anthony James Catanese, "Home and Workplace Separation in Four Urban Regions," *Journal of the American Institute of Planners,* vol. XXXVII, No. 5 Sept. 1971, pp. 331-337, and exchange of letters with Martin Wachs, *Journal of the American Institute of Planners,* Vol. XXXVIII, No. 1, Jan. 1972, p. 61; and Eastern Massachusetts Regional Planning Project, 3 vols. Boston: Metropolitan Area Planning Council, 1967.

The urban field is an artificial environment. Farms and forests are interspersed with clustered urban settlements and centers of productive work. But the land is no longer primeval: in a fundamental way, whether its use is in agriculture or not, it has become "urbanized." Architects call it a "plug-in city," by which they mean that anywhere within the urban field one can connect his home to an intricate and, for the most part, efficiently managed network of freeways, telephones, radio and television outlets, and electric energy and water supply systems.

THE DESIRE FOR INCREASED ENVIRONMENTAL CONTROL

This change to an enlarged living space has crept upon us silently. It is the unanticipated collective outcome of countless individual decisions to leave the city for the countryside. Different reasons have been propounded to account for this drive into the open spaces beyond the mother city, among them the steadily rising incomes, physical mobility, and leisure of middle-class Americans. I would like to suggest a more fundamental reason, however. The occupance of the urban field is an attempt on the part of a growing number of people to secure for themselves a measure of effective control over their immediate surroundings. Life in the older parts of the city is relentlessly encroaching upon personal space.[13] The protective shelter of one's environment is becoming thinner and thinner as strangers who follow life styles different from one's own move into established neighborhoods; as crime rates soar, endangering physical safety; as declines in land values threaten personal savings; as new traffic routes destroy the integrity of old neighborhoods; as air pollution lays down a blanket of smog over the city.[14]

Psychological stress increases with the city's pressure on the protective layers of personal space. As John Cassel has pointed out, people are no longer able to elicit anticipated responses to what were once appropriate cues, and one's neighbors can no longer be relied upon to conform with traditional values.[15] Accelerated urbanization is disrupting the character and strength of the group supports of individual lives.

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[12] These distances are calculated on the basis of central commuting. Although central commuting is declining in relative importance, it remains a useful criterion for delimiting the outer boundaries of the urban field which, because of their historical evolution, seem to bear a continuing relationship to the location of the core city.

[13] The best treatment of the concept of personal space is found in Robert Sommer's *Personal Space*. The Behavioral Basis of Design. Englewood Cliffs, N.J.: Prentice-Hall 1969. Personal space, according to Sommers, is a "portable territory" that involves the emotionally charged zone around individuals that may regulate spacing and is also concerned with the process of marking and personalizing space. For a recent assessment of this concept in terms of spatial geography, see Edward W. Soja, *The Political Organization of Space*. Association of American Geographers, Commission on College Geography, Resource Paper No. 8, Washington, D.C., 1971.

[14] In a recent study of the environmental preferences of New York City college students, safety was found to be of critical importance. (See Mark Hinshaw and Kathryn Allott, "Environmental Preferences of Future Housing Consumers," *Journal of the American Institute of Planners*, vol. XXXVIII, No. 2 (Mar. 1972), pp. 102-107.)

And, therefore, those who can afford it, pack up their things and leave, first for the suburbs and then, as even the suburbs are invaded by the perceived menace of urban life, for the dales of ex-urbia. Out there, among their own kind, in maximum security communities, they hope to build a haven for themselves. Environmental control seems so easy to purchase: one has merely to opt for it by moving away from the chaos of central locations to the rustic calm that is assumed to lie beyond.

All this is made easier by an accommodating government that provides not only low-cost lines of credit but also the necessary comforts for an increasingly dispersed environment for living. The social costs of this accommodation are enormous, but substantial savings accrue from letting the core city run down.[16] Expressways permit the recent urban refugees to draw on the resources of their vastly expanded living space: jobs, services, outdoor recreation. The city they have left behind has been pushed to the periphery of their cognitive map; its existence continues to be recognized chiefly because residences can relocate more swiftly than jobs, and there is still central commuting. Those who are left behind hang on because they cannot afford the price or rent of a suburban home or, in the case of the black population, are not permitted in suburbia. For these people, the city is rapidly turning into what Richard Sennett has appropriately called a survival community in which accommodation, constant watchfulness, and the erection of complex protective devices is the price of individual survival.[17]

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[15] John Cassel, "The Relation of Urban Environment to Health: Towards a Conceptual Frame and Research Strategy." Typescript, 1972. Empirical evidence on this point is presented by Gerald D. Suttles, *The Social Order of the Slum.* Ethnicity and Territory in the Inner City. Chicago: University of Chicago Press, 1968.

[16] I am not arguing that to "permit" the steady physical deterioration of the core city was at any time a conscious decision. If anything, the available evidence shows a rising concern with the physical condition of core cities. But it is hard to be persuaded that deterioration was not a result of an *implicit* policy to invest in the outward expansion of urban populations at the expense of the core city. The costs and benefits of this policy have never been studied. On the other hand, we are simply ignorant of ways to induce people to stay in core cities or, more drastically even, to return once they have left. The vast rebuilding program of Pittsburgh which took place in the late fifties and early sixties was unable to prevent a continuing absolute loss of population from the city of Pittsburgh to its urban field.

[17] Richard Sennett, *The Uses of Disorder.* Personal Identity and City Life. New York: Alfred A. Knopf, 1970. A low-income survival community on Chicago's Westside is described in frightening terms by Gerald D. Suttles, *op. cit.* There is no question but that the personal space of low-income and especially of minority populations is threatened even more than that of the relatively secure middle class. The failure of the former to escape into suburbia is not due, as I shall argue later on, to individual preference for living in the inner city but to economic reasons and, even more, to racial prejudice.

CLUSTERING: AFFINITY ENVIRONMENTS AND METROCENTERS

We are reenacting the great American drama. Suburbanites are going homesteading. The healthy and vigorous life, they imagine, can be pursued on the urban frontier. But homesteading in the 1970's is not what it used to be on the prairies of Nebraska a century ago. The early pioneers of this country set out to start a new life that they would make themselves. No one would ask them where they came from; each man and woman would test himself against the harshness of the wilderness; the past was left behind. But the modern pioneers of suburbia do not wish for a new life; they wish to reestablish an order of life that recalls the simplicities of an earlier day. They wish to protect their personal space.

In this, they behave very much like other human beings. If allowed to choose, people prefer living in social environments that are compatible with their own tastes. Give children an opportunity to design and build a model city, and they invent a city meant for children.[18] Others prefer the bustling street life of ethnic neighborhoods.[19] The people living in the faceless towers on Ocean Boulevard in Santa Monica are, for the most part, retired, rich, and Jewish: they came for the tranquil vistas of the Pacific Ocean. There are areas for swingers and areas for families with school-age children; there are bohemian sections and next to them marinas for yachting enthusiasts. There are districts studded with Catholic churches and others where gospel churches or synagogues predominate. There are exclusive havens for the very rich where bridle paths outnumber streets, and sections of the city where Spanish or Japanese is heard more frequently than English. The city is a system of ordered spatial diversity; its fabric is woven into a rich pattern of affinity environments.

An affinity environment may be defined as a spatially bounded social environment that is based on voluntary residential choice and characterized by a shared preference for salient attributes such as ethnicity, life style, income, occupation, age, family status, and religion. Suttles calls the resulting sociospatial pattern a system of ordered segmentation.[20] Other things being equal, affinity environments minimize the psychological stress of urban living at the same time that they maximize access to specific social amenities desired by the population, such as specialized food markets, religious schools and places of worship, social clubs, a certain housing style and density pattern; and educational and recreational facilities which evolve (or are created) in response to sizable aggregations of populations with a shared environmental preference. Affinity environments are supportive of group life.[21]

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[18] A model of the Venice Community in Los Angeles built by third and fourth graders is on display in UCLA's School of Architecture. It is a marvelous example of how children project their imagination upon the city to create a truly magical place for themselves.

[19] Jane Jacobs, *The Death and Life of Great American Cities*. New York: Random House, 1961.

[20] Gerald D. Suttles, *op. cit.*, ch. 2.

A spatial pattern of ordered segmentation is not unique to the American city. It is also found in older European and Islamic cities famous for their "quarters;" we meet with it again in the contemporary African city with its tribal enclaves in which traditional modes of social life are maintained at the same time that customary behavior undergoes a transformation toward an intertribal model more adaptive to urban living.[22] The tribal enclave is a way of coping with the shock of first encounter with the city. Like any affinity environment, it serves to reduce mental stress. In an account of the medieval Islamic city, Ira Lapidus emphasizes this mutually protective function of affinity environments:[23]

> The cities were divided into districts . . . These were residential quarters with small local markets and perhaps workshops, especially for weaving, but characteristically isolated from the bustle of the main central city bazaars . . . Lists compiled before the middle of the sixteenth century assign about seventy quarters to Damascus proper . . .
>
> Many of the quarters, though not every one need have been a solidarity, were closely knit and homogeneous communities. The tendency of different groups to seek the comfort and protection of their own members was very strong in a world where no man was truly safe except among his own kin. The solidarity of some districts was based on religious identity . . .
>
> Among the Muslims, different ethnic or racial groups lived apart. Aleppo had quarters of Turkomans outside the walls, a Kurdish quarter and a street of Persians. Many of the smaller towns also had quarters of Kurds, Turks, bedouins in process of sedentarization, or small communities of refugees from abroad.

A philosophical propensity to think more in terms of individuals than collectives has led many planners to overlook or minimize this essentially social patterning of urban space.[24] Where we find affinity environments, we tend to think of them as temporary historical residues rather than as the collective outcome of individual choice. Yet, the evidence is overwhelming. People prefer affinity environments because they seek to reduce the psychological cost of urban living to a (subjectively) optimal level, because they like to feel "at home" in the city.

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[21] According to Gerald D. Suttles, the local urban community is "the defended neighborhood which segregates people to avoid danger, insult, and impairment of status claims." This he considers to be a sufficient basis for explaining community differentiation. In addition, however, "the local community attracts to itself . . . hopes for the expression of self and sentiment. The desire to find a social setting in which one can give rein to an authentic version of oneself and see other people as they really are is not some unanalyzable human need but the most fundamental way in which people are reassured of their own reality as well as that of other people." (*The Social Construction of Communities.* Chicago: The University of Chicago Press, 1972, p. 264.) For a strongly supportive view, see Robert Dorfman, "The Functions of the City," in Anthony H. Pascal, ed., *Thinking About Cities.* New Perspectives on Urban Problems. Belmont, Calif.: Dickenson Publishing Co., 1970.

[22] William John Hanna and Judith Lynne Hanna, *Urban Dynamics in Black Africa.* Chicago: Aldine, 1971, ch. 6.

[23] Ira Marvin Lapidus, *Muslim Cities in the Later Middle Ages.* Cambridge: Harvard University Press, 1967, pp. 85-86.

[24] Herbert J. Gans, "Planning for People, not Buildings," *Environment and Planning,* vol. I (1969), pp. 33-46.

I do not wish to be misunderstood. The black and Puerto Rican and Chicano ghettos of our large cities did not result from voluntary residential choice. They are not affinity environments in the present sense. The urban ghetto exists because of racial prejudice and economic necessity. On the other hand, it would be unrealistic to think that affinity environments based on ethnicity and race would vanish if the gates to the urban field were to be thrown wide open. For some ghetto inhabitants, affinities based on criteria other than ethnicity would undoubtedly weigh more heavily in residential choice than spatial proximity to members of their own subcultures. But for many others, shared ethnic background and cultural expectations would continue to be the decisive criterion.

The push into the urban field is, therefore, likely to replicate the ordered segmentation of the core city, even though the existing diversity of affinity environments within the urban field is very much narrower than what it may become in the future.[25] The changing character of American society will eventually produce different "affinities" from those to which we have become accustomed, and questions of life style may loom more importantly than they have in the past. This is the conclusion of Roger D. Suttles:[26]

> With the decline of importance of racial and ethnic differentiation at the national level, socioeconomic criteria of occupation and education may be acquiring more significance and becoming more elaborated. But the growth of specialities, the number of people attending college, and the proliferation of tastes in a more cosmopolitan society may also bring about a finer partitioning of socioeconomic and age groups. . . . No doubt such groups will become progressively segregated into residential areas where they can retain an unchallenged version of their beliefs, values, and personal presentation. The problem of American communities, then, is to adapt to those more elaborated socioeconomic and age-graded bases of differentiation while relenting on the matter of race and ethnicity.

The new community movement in the United States has largely obscured this shift to life-style environments. The Federal Government is striving to achieve a mixture of income-graded housing in the new towns it chooses to subsidize.[27] What is not generally recognized, however, is that people who move into new communities wish to pursue precisely the kind of life that new communities make possible. Developers carefully design a variety of living environments in new communities with an eye to the market and popular tastes.[28]

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[25] The strongest evidence for this statement comes from Herbert J. Gans' studies of the social patterning of suburban America. According to Gans, "the move from the city . . . does not result in any major behavioral changes for most people. Moreover, the changes which do occur reflect the move from the social isolation of a transient city or suburban apartment building to the quasi-primary life of a neighborhood of single family homes. Also, many of the people whose life has changed report that the changes were intended. They existed as aspirations before the move or as reasons for it. In other words, the suburb itself creates few changes in ways of life." (*People and Plans.* New York: Basic Books, 1968, ch. 4, p. 41.)

[26] *The Social Construction of Communities, op. cit.*, p. 262.

A fascinating example of a specially built affinity environment is Leisure World Laguna Hills. Located just below El Toro on the Santa Ana Freeway near Los Angeles,

> Leisure World is a community of 14,000 persons whose common denominator is their age. They must be fifty-two at least, but few are that young, and the average is over seventy. Most are married couples, but there are a good many singles.
>
> They live in handsome and comfortable Mediterranean-style private residences called manors, with maintenance and gardening provided by the management. They enjoy three clubhouses with swimming pools, twenty-seven holes of golf, a 900-seat auditorium, hobby shops and card rooms, bowling greens and tennis courts, all included in a small monthly fee.
>
> They enjoy minibuses inside the community and to nearby shopping centers, and they are protected from the outside world by twenty-four-hour security gates and patrols. There is also twenty-four-hour medical service, a "convalescent hospital," a new hospital building, and no less than five architecturally modern churches just outside the gates.

Increasingly, the appeal is also to lower-income families.[29] Tract homes in southern California are currently advertised at prices ranging upwards from $15,000. Continued land price inflation will raise the total cost of housing as the more desirable portions of the urban field are occupied, but a Federal land bank program[30] could make a striking social contribution by opening the urban field to lower-income families.

In this connection, attention should be drawn to the spectacular rise of mobile-home communities. More than 50 percent of all single-family housing starts in the United States are mobile homes. Although there is an incipient trend in family parks, their appeal is primarily to childless couples with annual incomes between $9,000 and $15,000.[31] Less permanent than regular tract home areas because of their rapid physical obsolescence, they constitute themselves an important new affinity environment within the urban field.[32] Modular housing may eventually cut into the mobile home market, but the result would be much the same: at least for lower-middle-income groups, the urban field will be increasingly accessible.[33]

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[27] To date (June 1972), 10 communities with a projected peak population of 680,000 have been funded. All of them are within 50 miles of a metropolitan area.

[28] Jack Smith, "Leisure Is Their World," *Westways*, Apr. 1972, pp. 33 ff. One- and two-bedroom apartments at Leisure World range from $100 to $135 monthly, fees included.

[29] A recent story about industrialized housing suggests that rents for a five-room industrialized house may be as low as $90 per month. This price, of course, includes some Federal subsidy. (See "The Box Opens and Presto, It's a 3-Bedroom Home." *Los Angeles Times*, Mar. 10, 1972, pt. II, p. 1.) And, according to a 1967 study reported in the *New York Times*, 50 percent of the AFL-CIO union membership lived in suburban areas; this figure rose to 75 percent for all union members under the age of 30. (*New York Times*, Sept. 5, 1967, as reported by Alexander Ganz, *Emerging Patterns of Urban Growth and Travel*. Massachusetts Institute of Technology, Department of City and Regional Planning, Highway Transportation Program, Transport Report 68-1, Jan. 1968, p. 57.)

[30] Such a program is outlined in a recent article by Bernard Weissbourd, "Satellite Communities: Proposal for a New Housing Program," *The Center Magazine*. Reprint. N.D.

In response to new demands, affinity environments for currently excluded populations will be built within the urban field.[34] As recent surveys show, the demand for suburban homes is nearly universal among disadvantaged and minority populations.[35] Federal programs will be necessary to accommodate these groups, particularly those with incomes under $9,000. But the broad ecological patterning of the new communities is clear: in many respects it will be similar to that of the familiar city. Only its spatial extension will be markedly different. Distances among affinity environments within the urban field will be greater than in the mother city, and clusters of higher density will be interspersed with relatively open, parklike space. The size of these clusters may range from a few hundred dwelling units to several thousand. They are likely to be freestanding rather than additions to existing towns and cities in the urban field. Their density, however, may be substantially higher than that of the typical suburban community, though lower than core city areas. The densities of recent new communities range from 2 to 11 living units per gross acre. This compares to an overall density of 2 living units per gross acre for 268 urbanized areas in 1960 and 32 living units per gross acre for Manhattan Borough, New York City.[36]

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[31] An advertisement in the *Los Angeles Times* (May 27, 1972) describes the community facilities in a newly opened family park in Anaheim: "Enjoy Country Club Living: Private clubhouse, recreation center, swimming pool, heated swirl pool, billiards, card and game rooms, social center with TV & fireplace, group party kitchen, shuffle board, children's playground plus wading pool, big wide open green grassy areas. Children and small pets welcome! Separate adult and family sections." Nor is this by any means the plushiest of areas. Lakefront developments and imported statuary are additional amenities offered in some parks. Current investments are on the order of $1 million per 100 mobile home units.

[32] See Constance B. Gibson, *Policy Alternatives for Mobile Homes*, Center for Urban Policy Research, Rutgers University, 1972, and the earlier economic study by Karen Brecher Alschuler and Robert Stedman Betts, "Mobile Homes: Evolution of the Market, Consumer Costs, the Taxation Controversy, Comparative Costs," Working Paper No. 123, Institute of Urban and Regional Development, University of California, Berkeley, Jan. 1970.

[33] Modulars, like mobile homes, are factory built, but the former are made to conform to local building code specifications, are considered permanent structures and hence qualify for mortgage financing rather than the typical auto-loan financing for mobiles. Because of longer-term financing at lower interest rates, monthly payments will be less for modulars. Constance B. Gibson, *op. cit.*, p. 17.

[34] The following quotation from Weissbourd (*op. cit.*, p. 6) is to the point:

> It will be necessary, however, to design separate programs for different income groups. Only families earning more than ten thousand dollars per year are able, at current market prices, to afford new homes or apartments outside the South. In the northern and western metropolitan areas approximately thirty-two percent of all black families earn more than ten thousand dollars a year, as compared to fifty-two percent of all white families. This means that in a metropolitan area with a population which is, say, twenty percent black (though most, of course, have a smaller percentage of black families) approximately thirteen percent of the total families who could afford to move into suburban areas might be black.

[35] Hinshaw and Allott, *op. cit.* Also, Florence C. Ladd, "Black Youths View their Environments: Some Views of Housing," *Journal of the American Institute of Planners*, vol. XXXVIII, No. 2 (Mar. 1972), pp. 108-115.

Serving these residential clusters in the interstices, at points of optimum access, new metrocenters will come into being. Starting as regional shopping plazas, other activities will be added: office buildings, hotels, museums, cinemas, community colleges, and high-rise apartment towers—all adding up to yet another affinity environment for work, shopping, leisure, education, and residential living.[37] They will become specialized centers in which the residents of many separate affinity environments—the tribal enclaves of the urban field—can come together for the enjoyment of common facilities. Because of its size, the urban field cannot be held together by a single center; it requires many centers for its complete articulation.

To test the viability of this arrangement, we should ask whether the spatial dispersion of the business district of core cities will not inhibit vital city functions. According to conventional thinking, large cities are desirable in part, because they facilitate face-to-face contacts among their managerial elites—they act as centers of control and innovation—and also because they allow for substantial savings from agglomeration.[38] Two major dimensions, however, characterize the large city and must be separately considered: large size and high density. How do these affect the performance of vital city functions, and does the loss in size and density resulting from dispersion augur a comparable loss in the efficiency of urban fields?

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[36] HUD *International Brief*, No. 6, U.S. Department of Housing and Urban Affairs, Office of International Affairs, June 1971, p. 20. Such size and density configurations suggest that the clustered dispersal of population into the urban field may be less costly in terms of supporting infrastructure than it is normally thought to be.

[37] This image of the urban field in which affinity environments are interspersed with metrocenters puts recent discussions of new towns policies into a new perspective. The presumptively innovative aspect of new town design is the physical integration of work places with areas for residential living in ways that would reduce the journey to work to only a few minutes. Within the urban field, however, work places are physically separated from homes, though average time distances would probably be held to within less than half an hour. It is questionable whether the desire for minimizing the time spent in the journey to work is, in fact, so strong that it overwhelms other considerations. (See Anthony James Catanese, *op. cit.*) If this is the case, new towns built according to the classical model had better be viewed as affinity environments for that relatively small part of the population for whom job mobility is a matter of small consequence but time spent in commuting a very major concern.

[38] In their pathbreaking study of the metropolitan economy, Stanback and Knight argue that the future development of large "nodal" cities depends on the strength and vitality of their CBD. (Thomas M. Stanback, Jr., and Richard V. Knight, *The Metropolitan Economy*. New York: Columbia University Press, 1970, p. 232.)

Face-to-face contacts appear to be more closely related to density than size. The former determines the frequency, the latter the volume of interaction. Agglomeration economies, on the other hand, are primarily a function of market size, though density may enter as a subsidiary variable by facilitating access to markets.[39] The dispersion of the compact business district into the urban field—by reducing its size and overall density and by multiplying the number of centers—might therefore be regarded as impairing the role of cities in the development of regions and the Nation as a whole. It remains to be seen, however, whether a substitution of mobility for place might not compensate, at least in part, for this presumptive disadvantage.

Suppose that the door-to-door travel speed in central cities is 10 miles per hour, but three times this rate within the urban field. Assuming an average traveltime of 20 minutes, one could cover 3.3 miles in the central city for every 10 miles in the urban field. If we now assume that metrocenters with a daytime population of approximately 50,000 are regularly spaced 10 miles apart, a person would be able to contact, without spending any more time than he would otherwise do, individuals from a total pool of 450,000 people (50,000 × 9). For all but the very largest cities, this would seem to provide a rough equivalence in market size and population with respect to the central business districts of core cities. From this we may conclude that for purposes of control, innovation, and economy, the urban field can function much like the traditional core city. What it may lose in these respects will be made up by its greater livability, including smaller residential scale, reduced congestion, and quicker access to outdoor recreational areas.

The belief that urban field communities should be self-contained cities must, therefore, be considered obsolete. This conclusion is supported by the evolution of British thinking on new towns:[40]

> The Mark I towns, such as Harlow, were conceived as relatively small, physically well defined, and self-contained. But self-containment disappeared with the automobile and the Mark II towns, built to reflect the trend toward universal car ownership, made the idea of self-containment even less practical. Later, therefore, the Mark III series of new communities recognized that the automobile age had introduced a new freedom to live, work, and shop wherever desired, and that made it impossible to confine new town residents to their own community or to protect against automobile invasion from the outside.

FREEDOM AND FLEXIBILITY OF MOVEMENT

Two kinds of demand are giving form to urban fields. The first is for increased personal control over one's immediate environment. It is met by private developers who build affinity environments to the taste of their customers and join in the construction of tightly designed metrocenters. These high-density clusters are built—or can be built—on a pedestrian scale. The second is a demand for diversity of choice among jobs, shopping, services, and recreation. Under conditions of overall low density in urban fields—which we may estimate at less than 1,000 persons per square mile—this call for increasing diversity of choice can only be met by substituting mobility for place. It is extremely unlikely that, in a multicentered system, the necessary mobility can be provided in any way other than by automobile expressways: the urban field depends on individual facility of movement.[41]

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[39] High level of traffic congestion, of course, may deny some of the advantages of density.

[40] Wilfred Owen, *op. cit.*, p. 65.

In his excellent new book, *The Accessible City*, Wilfred Owen argues that the redesign of the urban habitat is an essential condition for overcoming mounting problems of traffic congestion:[42]

> Mobility depends on how thoughtfully space has been allocated and how efficiently activities have been arranged. The great delusion is that building more capacity will somehow lead to a congestion-free environment, with all the desired urban advantages. . . . Planned communities, by rejecting the outdated concept of separating urban life into compartments by zoning, have demonstrated that the transportation problem can be contained by focussing on non-transportation solutions that emphasize accessibility rather than movement.

His proposed solution is the regional city—comparable in all respects to the urban field,[43]

> which combines urban densities with close-by country living. The regional city is made up of interconnected clusters surrounded by low-density uses, where the special benefits of concentration can be enjoyed without succumbing to a continuous urban buildup unrelated to the countryside. The multi-centered city offers a compromise between undesirably high density and the destructive side effects of indiscriminate sprawl.

Owen's regional city presupposes continued reliance on the automobile as the major mode of transportation. He, as others in America have done, bows to the inevitability of private motor transportation:[44]

> The automobile is at the top of the list of what most people want, whoever they are and wherever they live. High taxes and restrictive policies designed to discourage car ownership have not had much effect, nor have the inconveniences of urban traffic. People still drive under the most adverse conditions, or they move out when conditions finally become unbearable.

In face of this relentless pressure for automobility, public transport has been losing ground. In 1970, Owen reports, transit patronage "was only 7.3 billion rides, less than half the volume in 1930."[45] Recent enthusiasm among planners for a renaissance of rapid transit overlooks the fact that even the most optimistic national projections forecast only an additional 160 miles of subways by 1990.[46] Most of these will be built within core cities of 1 million population—

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[41] An important corollary to this statement is that a severe restriction on the availability and use of automobiles would quickly curtail the settlement of urban fields. This, however, I do not consider to be a realistic alternative in the foreseeable future.

[42] Wilfred Owen, *op. cit.*, p. 134.

[43] *Ibid.*, p. 112.

[44] *Ibid.*, p. 21.

[45] *Ibid.*, p. 26.

> where employment in the central business district (CBD) is more than 100,000 people in a concentrated area, and where the total CBD trip destinations amount to some 300,000 a square miles. The population density of rapid transit cities is typically in the range of 14,000 to 20,000 persons per square mile with one-way peak volumes exceeding 10,000 to 15,000 persons an hour per corridor.[47]

Though future metrocenters in the urban field may conceivably be linked to each other with an efficient rapid transit system, I take it to be very unlikely. But even if built, the probability that such a system would absorb a substantial proportion of potential riders is surprisingly low. According to recent transit studies for Atlanta, Los Angeles, St. Louis, San Francisco, and Washington, D.C., only 5 percent of the daily person trips would be made by rapid transit in these areas.[48] More recent estimates for San Francisco's much-touted BART System claim no more than 3.5 percent of daily person trips at full capacity.[49]

These forecasts must be put in a perspective of future travel patterns. In a transport study of the Eastern Massachusetts Region, most of the projected vehicle miles by 1990 are expected to occur *outside* the famous circumferential Route 128 which, only a decade ago, was thought to define the outer boundary of the Boston area and contained over one-half the actual vehicle miles at the time.

> By 1990, with trips to and from the city of Boston accounting for only 9 percent of the area's arterial and freeway vehicle miles, a projected 60 percent of all vehicle miles would occur in trips outside of Route 128. Expected trip length will grow by one-quarter, but this added length would be offset by improved travel speeds.[50]

With more than a doubling of travel demand by 1990, rapid transit and commuter railways in eastern Massachusetts are projected to grow by only 15 percent.[51] And for the country as a whole, Alexander Ganz of MIT foresees a decline in the role of public transport from 20 percent of all intrametropolitan trips in 1960 to only 13 percent in 1985.[52] On the other hand, high-density corridors, especially in the northeastern United States, may make a rigidly linear system of rail transportation economically feasible. Systems, such as the one between Boston and Washington, D.C., would connect primary urban fields to each other in competition with air transport. It would not provide substantially for travel within each major field.[53]

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[46] *Ibid.*, p. 27.

[47] *Ibid.*, p. 28.

[48] Alexander Ganz, *op. cit.*, p. 108.

[49] Verbal communication, Wilfred Owen, The Brookings Institution.

[50] Ganz, *op. cit.*, p. 130.

[51] *Ibid.*

[52] *Ibid.*, p. 109.

[53] It should be noted that the dispersed travel patterns in the urban field may dramatically reduce present congestion levels on freeways which are the result primarily of central commuting patterns, while a reduction in air pollution is likely to come from radical improvements in engine design. People without cars—and they might contribute as much as one-fifth of the labor force in the future—would continue to depend on buses for their essential travel needs. The extensive use of the computer in flexible bus routing procedures may offer some possibilities for more efficient service in this sector.

ENVIRONMENTAL QUALITY: A FUNCTION OF RESOURCE MANAGEMENT

I do not wish to imply that the automobile does not contribute its share of problems to the urban environment. The massive invasion of the far reaches of large cities by a population that is mobile, well to do, and has a taste for outdoor recreation is putting increasing pressures on the available resources for urban living.

The issue is a subtle one. A simplistic approach would argue that, in order to save these resources from ultimate destruction, demand for them will have to be reduced. Increased intensity of use, however, does not inevitably have negative effects. Throughout history, the conversion of deserts and prairies into farmland has generally improved the quality of the original resource. A rigorous regime of resources development would raise the productivity of land over its unspoiled state. Breakdowns would occur only when, because of ignorance or negligence, management failed. This would then lead to overgrazing, overcutting, soil erosion, siltation, floods, and ultimate abandonment.

In the occupance of urban fields, the major problem affecting environmental quality lies in the threatened destruction of key amenity resources. This has two aspects, the first relating to the temporary but recurring and intensive uses of desirable open lands for recreation; the second to the esthetics of the natural landscape.

I have chosen to ignore the problem of air pollution, chiefly because I believe this problem amenable to a technological solution. Richard Clark, however, has stated to me:

> I would not be so sanguine as you are on the technological possibilities for improvement of automobile engines. The projections of the State Air Resources Board of California indicate that assuming (i) continued growth at the present rate in the population of automobiles in the Los Angeles air basin, (ii) continuance of the present pattern of automobile obsolescence, (iii) the availability on time of automobiles meeting the most stringent standards now scheduled (those for the 1976 model year), and (iv) no substantial increase in the amount of emissions from stationary sources (particularly the present form of electric power generation), only by the early 1980's will air quality approach the level of the early 1940's (when, it is thought, air pollution was not a problem). Immediately thereafter, however, the level would start to go up again as a result of the expanding stock of automobiles.
>
> The number of things that could go wrong with this prediction, even if you were encouraged by it, are almost uncountable. Most importantly, the rates of population growth or of automobile use per capita could go up (I take it that your scenario comes close to implying the latter) or the use of processes generating stationary source emission could increase. Of course, the use of nuclear power makes occurrence of the latter possibility unlikely, but even this is not without some uncertainty. It has been predicted that the present supply of uranium will not last beyond the middle 1990's (I'm not sure what rate of consumption was used as the basis of this prediction).
>
> However, it is now apparent that areas like Los Angeles which have not had high atmospheric concentrations of sulfur compounds because of the use of natural gas for the generation of electric power will have increasingly to turn to fuel oils for the purpose (with an accompanying increase in sulfur emissions) given the decline in availability of natural gas.

> What may save us, of course, is a new type of automobile but, among other reasons, given the present investment of the automobile manufacturers and the oil and gas companies, I think one would have to be very optimistic to foresee the complete replacement of the hydrocarbon burning engine in anything less than the very long run. Even then, of course, some kinds of new cars may be nearly as bad as the present ones; the electric automobile, for example, on which considerable research has been invested, might generate as much pollution indirectly as present automobiles do directly.

The failure to perceive both open land and landscape quality as limited resources helps to account for the still widespread apathy toward questions of resource management in the urban environment. This apathy is changing to concern as we become aware that nearly all of our lives will have to be spent within the boundaries of urban fields. Accepting the growing scarcity of urban-field resources requires a drastic reevaluation of our attitudes toward the bounded environment.[54]

The crucial discovery has been that the supply of available land in parks, beaches, lakeshores, and riverbanks, no less than scenic beauty, is extraordinarily limited in relation to potential demand, and that the very quality for which these resources are valued may be destroyed through excessive, unregulated use. This problem is exacerbated by holding to a democratic ideology which insists on equality of individual access to these resources. The tranquility of wooded areas, fields, and streams used to be regarded as the exclusive privilege of the wealthy. Lower user densities and the responsibilities of perpetual ownership insured the practice of good management on this land. But the rapid democratization of the urban field has brought with it enormous problems.

Just as overgrazing leads to erosion and destructive floods, so the unregulated use of fragile ecologies may lead to their steady and irreversible destruction. The California desert is a case in point. Much of this magnificent desert lies on the outer edges of major urban fields or within easy reach of them. Eleven million acres of desert land are administered by the Bureau of Land Management. In 1968, the Bureau estimated recreational uses of the desert at 5 million visitor-days and projected this to 14 million by the year 2000. Visitors come fully equipped for capital-intensive leisure. More than 1 million motorcycles, trail bikes, dune buggies, and other off-road vehicles are registered in California, and many of them have churned deep ruts into the desert that, after 30 years, still bears the scars of tanks from World War II maneuvers. The Bureau of Land Management and the State department of parks and recreation have both tried to restrict these vehicles to special areas, but lack of manpower and the vast areas involved have largely nullified their efforts. Meanwhile, the sales of off-road vehicles, promoted by advertisements, continue to soar. A recent billboard display in Los Angeles shows a motorcyclist "conquering terrain . . . going to places you couldn't go before and tearing up the land to get there."[55] The message could not be clearer.

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[54] Harvey S. Perloff, "A Framework for Dealing with the Urban Environment," in Harvey S. Perloff, ed., *The Quality of the Urban Environment*. Baltimore: The Johns Hopkins University Press, 1969.

The second danger resulting from the rapid settlement of urban fields arises from the construction of tract homes, recreational communities, and mobile-home parks wherever land can be acquired cheaply. This practice is leading to an inefficient social use of land by preempting alternative and higher uses; it is also affecting esthetic values by giving the impression of a continuously urbanized chaotic landscape. Ill-fitted into the natural terrain, these subdivisions, metrocenters, and new communities often take away from the potential enjoyment of the environment by all inhabitants and visitors. This result raises the question of how individual and private choices can be reconciled with the interests of the larger community.

THE DECLINE OF CIVIC CONSCIOUSNESS

The spatial structure of the urban field grows out of the aggregate of individual demands for psychic security, mobility, and open space. It is assumed that government will somehow provide the guidance necessary to insure that the countless, self-serving decisions of individuals will work to the benefit of all the people or at least will have neutral effects on the larger community. But this assumption has little basis in fact. Government, like business in this country, neither leads nor guides; it follows consumer demand. Indeed, it makes a virtue of following.[56]

A policy of allowing unrestrained consumer choice determine urban form leads to collective disaster. There are no quick solutions to problems that have been gathering over the decades. And when the crisis can no longer be avoided, government intervention is fragmented, too little, and too late.

Most people are unaware that by acting as individual consumers of space they do not get what they would want as members of the commonwealth that sustains them. As citizens of urban fields, they get what they ask for: affinity environments and metrocenters. But these private goods are purchased at great cost. Amenity resources of the urban field will be impaired until they cease to be attractive. More seriously, the diligent search for consumer satisfactions and security of private space on the periphery has led to the massive exodus of whites from central cities. Minority populations have occupied the vacant homes they left behind, but not in numbers sufficient to avoid the virtual abandonment of many residential areas.[57] According to one study, approximately 7 percent of New York's housing stock may be vacated over the next 6 years.[58] One frequently cited estimate asserts that in New York City alone, 52,000 housing units are being abandoned each year. In certain sections of St. Louis, 16 percent of the housing structures have been left to deteriorate, and in the Woodlawn and Lawndale areas of Chicago, 15 to 20 percent of the units 10 years or older have been demolished, are boarded up, or stand vacant and vandalized. The story is much the same in other large cities.[59]

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[55] Philip Fradkin, "Sands of Time Running Out for the State's Desert?" *Los Angeles Times*, Feb. 13, 1972, sec. C.

[56] Edward C. Banfield, *Political Influence*. The Free Press of Glencoe, 1961.

[57] In SMSA's of 500,000 or more, 13 percent (13.3 million) of the total population is black (1970). In the central cities of these areas, the black population was nearly double this ratio, or 23.7 percent (10.8 million). An estimated 200,000 middle-class blacks are moving to suburban areas each year, most of them to inner ring black communities. This represents 2 percent of central city black populations and barely compensates for the natural increase of these populations. As a result, the proportion of black people in central

But the predominantly black population that has moved into the houses formerly occupied by whites is not content to remain there. The following incident is suggestive of what may happen on a massive scale in the future.

Not long ago, the members of the black community in Detroit walked out of a conference discussing a private redevelopment scheme, because they did not feel that the conference addressed itself to all the problems of housing in the metropolitan region. *They demanded access to the suburbs.* In time, another plan was submitted that would "pair" a development project in the heart of Detroit with one on the fringes of the city. With $1 billion at stake, the private developers proposed a project that would house 75,000 people of the community in the suburbs and 25,000 in the inner city. This plan apparently won the support of the blacks.[60] It is only a matter of time before occurrences such as this will become commonplace. Vast portions of the inner city will then be abandoned for suburban locations in yet another stage of the vast migratory process that initially gathered rural populations in cities only to release them into the outer reaches of the urban field.[61]

The new communities program of the Federal Government is already opening up urban field locations for low-income minority populations, but at

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cities has been gaining steadily from in-migration, even though the total number of in-migrants has been *less* than the number of both whites and blacks who are resettling on the fringes of core cities. Data are from Weissbourd, *op. cit.*, chart 1, and from Lawrence Elliott Susskind, "Guidelines for State Involvement in the Development of New Communities in Massachusetts: Toward a State Urban Growth Policy," in *Papers on National Land Use Policy Issues.* Prepared for the Committee on Interior and Insular Affairs, U.S. Senate, Washington, D.C., 1971, p. 29.

[58] Robert Powell Sangster, "Abandonment of Inner City Properties," Federal Home Loan Bank Board, *Journal*, vol. 5, No. 2 (Feb. 1972), p. 14.

[59] *Ibid.* See also Sangster's master's thesis, "An Analysis of the Interaction of Disinvestment Policies of Financial Institutions and the Phenomenon of Urban Housing Abandonment." UCLA, School of Architecture and Urban Planning, June 1972.

[60] Ed McCahill, "Detroit–Motown at the Crossroads," *Planning.* A Newsletter of the American Society of Planning Officials, vol. 38, No. 2 (Feb./Mar. 1972), p. 35.

[61] Institute for Defense Analysis, *Economic Characteristics of the Urban Public Transportation Industry.* Washington, D.C.: Department of Transportation, Feb. 1972, table 1.5.)

The task of redeveloping central city areas will require heroic efforts and an unwonted ingenuity. New Town-Intown schemes seem to be gaining popularity, but it is unlikely that they will succeed in attracting substantial numbers of urban field populations back into the mother city. (See Harvey S. Perloff, "Intown New Towns Versus Outlying New Towns," paper presented at the Conference on Human Factors in New Town Development, UCLA, June 22-23, 1972.

present, the gesture appears to be little more than symbolic. Over the next generation, however, with an improvement in the economic situation of blacks and other minority groups, the rate of nonwhite migration into the urban field is likely to increase considerably. A large and growing proportion of those left behind may be constrained from following this outbound trek more by their lack of an automobile than by discriminatory practices or even the costs of housing. In 1970, the percent of households not owning cars in selected metropolitan areas ranged from 12.8 in Minneapolis-St. Paul to 29.1 in Pittsburgh and 41.2 in New York. These ratios were substantially higher in poor and minority areas.[62]

These shifts in population seem to occur with the compelling force of natural events. No one seems to consider the extraordinarily high costs imposed on others by a process that is triggered by individual decisions. Indeed, most people do not perceive the urban field as a new form of the human habitat or as a territorially defined—if spatially extended—subsystem of society. Each of us can only come to know a fragment of this system. We pass across its psychic wastelands at high speed, oblivious of the fine web of social and economic relations that articulate its parts and join the fleeting vistas into a regional network of communities. We have become strangers in our own home. Without a doubt, when our own affinity environment is threatened, we react strongly, even violently. But the farther we move away from this environment—and the circumference of a 50-mile urban field is a day's journey of 300 miles—the more indifferent we become to the fate of our fellow citizens. The affinity environment is important to us because we have chosen it, but also because we have money invested in it, and because our sense of well-being depends on it. The average family spends as much as 60 percent of its total time within the territorial confines of its own neighborhood.[63] While this proportion may decline as more women enter the labor market, the end result will be the same: civic commitments will continue to be confined to affinity environments. The urban field does not inspire civic loyalty.

At the level of the urban field, therefore, government is carried on the slippery shoulders of public indifference. Councils of Government which, by now, have been formed in nearly all metropolitan areas, are primed to act only when disagreement is low. As Ed McCahill puts it, "SEMCOG [the Southeast Michigan Council of Governments] will deal with issues which everybody is for—they are for being against drugs because it's becoming a white man's problem—but they won't deal with housing—a black's problem.[64]

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[62] See note 61, above.

[63] Based on a national sample of adults in 1954. See Sebastian de Grazia, *Of Time, Work, and Leisure.* New York: Anchor Books, 1962, table 3. This high ratio gains in salience if children are included. Almost all the time of younger children is spent within a radius of one mile from home.

[64] McCahill, *op. cit.*, p. 38.

But even Councils of Government do not extend their weak, uncertain authority far enough. While the urban field is acquiring reality as a territorially organized subsystem of society, its day-to-day management remains in the hands of hundreds of separate governmental units. A political mechanism for resolving the problems of growth and development at the level of the urban field does not exist, and its creation is resisted. In the absence of a strong system of governance, the future of the urban field will be determined chiefly in the marketplace for land and, more concretely, by the private owners of the land and the institutional arrangements which support them.[65]

TOWARD NEW FORMS OF GOVERNANCE

A realistic look at the future of the urban habitat is bound to terminate in a mood of glum resignation. But at least we have succeeded in identifying one of the major problems which lies at the root of our despair. This is the governance of urban fields.

The fundamental issue is whether the urban field can and should acquire the essential characteristics of a regional city, a true *civitas*. Given the present lack of civic concern with the urban field as a whole—a lack that partly reflects the invisibility of its network of functional relationships—suggests that the most probable outcome for governance is a gradual evolution of power from local communities upward to State and Federal levels. The failure (or unwillingness) to come to grips with the governance of urban fields thus implies the continued emasculation of territorial governments below the level of the State. Increasingly within recent decades, local citizens in the United States behaved as if they were the casual residents of a hotel. They took for granted the adequate provision of services they had come to expect and were content to be "managed" by professionals and experts so long as their particular demands were gratified. When this was not the case, they usually moved on to another hotel. "The fact remains," Oliver William asserts, "that most urban dwellers vote by moving van, not by ballot box and that coalitions, not communities, are the characteristic urban collectivity."[66] If this is true, however, as I believe it is, one is left to wonder whether a "managed" society is ultimately preferable to one that is self-governing. Technical experts have only an arbitrary calculus for weighing the costs and benefits of their decisions as they impinge on different collectivities. Except for consulting their own souls, they have no way of knowing which decisions would enact the public good. To turn over the governance of urban fields to technical experts means, therefore, to relinquish our right to have a voice in the distribution of costs and benefits. So long as the urban frontier was open, exit rather than voice was frequently chosen as a solution to situations that had become insufferable.[67] But the urban frontier has finally been closed. Exit is no longer possible. In Wilfred Owen's words:[68]

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[65] According to Oliver P. Williams, existing processes seeking to regulate the use of land are "effectively neutral, and projects for which the merchants of access have customers will be built. A political toll may be exacted, but this has little effect on what will and will not be built." (*Metropolitan Political Analysis. A Social Access Approach.* New York: The Free Press, 1971, p. 18.) Williams' book is a scathing indictment of the socially disruptive results that flow from the exercise of unrestricted power for private economic gain.

[66] Oliver P. Williams, *op. cit.*, p. 35.

> Many who drive farther in order to live better find that too many others have had the same idea. The only recourse is to move again, in much the same way as those who exhausted the soil in an earlier period of history moved on to virgin territory. Sooner or later, outward dispersal from one city will run into suburbs spreading from the opposite direction, and the escape routes will be closed. Meanwhile the pollution of the roadsides by unchecked commercial exploitation transforms much of the countryside into the low-density slums of the motor age.

If we accept this interpretation of the urban condition, the conclusion is forced upon us that the exclusion of politics from the management of urban fields is no longer an acceptable alternative. Voice must replace exit in the exercise of our rights as local citizens. This, however, leaves the question unanswered of how the new political game is to be arranged. One alternative would be to invest the State with greater powers of planning for and control over the settlement of urban fields. In view of the present incapacity of local governments to cope with their own problems, this is the most probable alternative in view.[69] But the solution is seriously deficient. Not only do many urban fields overlap State boundaries, but the individuality, scale, and complexity of urban fields require more attention to detail, quicker responses, and greater responsiveness to problem situations than State governments are likely to manage. The end result would be a vastly expanded and cumbersome State bureaucracy which, like its Federal counterpart, would be incapable of subtle and speedy intervention.

A second alternative would be to transform existing Councils of Government into multipurpose regional governments with an elected legislative body and jurisdiction over a wider area than at present. This alternative was recently proposed within the framework of *The California Tomorrow Plan*, prepared by a citizen task force. According to the plan[70]—

> Strong regional governments are absolutely essential. . . . To give all Californians, residents of metropolitan and outlying areas alike, representation at the regional level, the legislature can establish major regional subdivisions of the State, set up the organization of a multi-purpose government for each region, assign responsibilities to regional government, and provide for the necessary funding.

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[67] Albert O. Hirschman, *Exit, Voice, and Loyalty*. Responses to Decline in Firms, Organizations, and States. Cambridge: Harvard University Press, 1970.

[68] Wilfred Owen, *op. cit.*, p. 15.

[69] Strengthening the role of State governments in urban field governance is forcefully advocated by Anthony Downs, "Alternative Forms of Future Urban Growth in the United States," *Journal of the American Institute of Planners*, vol. XXXVI, No. 1 (Jan. 1970), pp. 1-11.

[70] *The California Tomorrow Plan*. A First Sketch. San Francisco: California Tomorrow, 1971. Copies of the Plan may be obtained by writing to California Tomorrow, 681 Market Street, San Francisco, California 94105.

If the proposed regionalization of government were to follow the contours of the urban field, such governments might emerge as part of a larger solution that would involve major readjustments at all levels of territorial governance. At present, though, the outlook for elected and politically responsible governments at the scale of urban fields is not very promising.

The third and final alternative envisions a tiered hierarchy of multipurpose governments arranged according to a principle of territorial specialization. At the neighborhood level, elected community assemblies would address themselves to those issues of local governance which are of most direct concern to residents within affinity environments and which could be effectively internalized at that level. Day-care centers, elementary schools, public libraries, local parks, health care, local policing, internal traffic control, and zoning might be among their major projects. At the next higher level, elected representatives from among the membership of several community assemblies might meet in district assemblies at a metrocenter to deal with such problems as high schools, public health, large-scale recreational facilities, and solid-waste disposal. Members of district assemblies would, in turn, be elected to join in a regional assembly for the entire urban field to consider major internal circulation problems, justice, open space controls, antipollution measures, public utilities, economic development, and higher education. At the State level, finally, government would set general standards, guidelines, and policies, exercise a reviewing function over local planning, and concern itself with the management of interregional systems and, particularly, with the question of resource allocation among urban fields.[71]

The cellular system of governance for urban fields I have described seeks to return a measure of effective control to the local community without imposing closure upon the provincialism that is latent in the concept of neighborhood government. Territorial power in America has gradually been drifting upward, leaving the bulk of the population with little more to do than to pursue their private pleasures, fend off unwanted neighbors, engage in generally futile remonstrances against shadowy external forces and, in the case of the poor, struggle for individual survival. Yet the all-too-apparent vacuum of power at the local level is not completely filled by State and Federal Governments. As a result, the quality of the physical environment is to a large extent an outcome of the ungoverned interplay of individual, utilitarian interest that, even though they may occasionally cluster into territorial or sectoral coalitions, rarely combine to advance the common good. Despite much rhetoric on the opposing side, a community perspective does not enjoy legitimacy in American society. In fact, a recent magisterial study of community organization sustains the thesis that fear of one's neighbors is the principal variable acc[illegible]he territorial integrity of territorial communities.[72]

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[71] This territorial division of tasks represents an elaboration of a distinction first proposed by Oliver Williams between life style and system maintenance policies. See Oliver P. Williams, *op. cit.*, pp. 88ff.

[72] Gerald D. Suttles, *The Social Construction of Communities, op. cit.*, Ch. 9.

The separation and fragmentation of power is one of the shibboleths of American political thought. Yet this ideology and its sustaining myths contribute only to the disappearance of effective local governance in the name of a population that, even though it lives and works within the urban field, lacks any ability to formulate a significant collective purpose. The proposed cellular structure of governance is designed to minimize the frictions resulting from an infinitely small territorial division of powers. Curiously, this inability to organize for collective action is detrimental even to the particularistic interests of local groups which remain completely undefended so long as the virtual moratorium on effective action at more encompassing societal levels continues.

A cellular system of governance would no doubt require new legislation and even constitutional reform to become operational. Because of its reliance on indirect elections at all except neighborhood levels, it eliminates the power of communities to impose a veto on each others' initiatives. It further implies that representatives of the local community will simultaneously be active at different tiers in the three-step hierarchy of assemblies within each urban field, thus insuring a rapid exchange of information up and down the hierarchy and back to the neighborhood of origin. It will also facilitate direct citizen access to, and control over, their representatives to a degree unheard of until now. Community representatives will be personally known to a significant number of local residents. Assuming direct and popular elections to the community assemblies in the urban field, and setting aside the question of representation in the State legislature, the local delegates to district and regional assemblies, elected indirectly, would have as much political influence to dispense as those who have a popular constituency. All that would be required is to insist that, say, one-half of all delegates be elected annually, and that reelection to office would not be possible, except following an appropriate interval of years. The quick rotation of delegates would thus be assured, with a sizable proportion of the adult population becoming eligible for political office during their lifetime.[73]

Over the past decade, the phrase "community of limited liability" has frequently been used to describe the fact that local residents do not "dissolve" into the communal soul, but reserve important interests for other engagements. But, as I have tried to suggest, even the limited claims of the local community may turn out to be quite substantial. Some needs of local residents are best met locally; others require more general, systemwide forms of governance.

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[73] To give an idea of the system of representation, we may carry out the following calculation. Assume that each neighborhood has a population of 10,000 and a community council numbering 40 members. If each community assembly were to elect two delegates to a district assembly also limited to 40 members, 20 neighborhood areas would compose a district with a total population of 200,000. If district assemblies would each elect 4 representatives to a regional assembly of 40 members, 10 districts would comprise a region of 2 million inhabitants. At least according to this scenario, the problem seems quantitatively manageable.

Without the former, however, the latter would remain an empty gesture. The transformation of the urban field into a true *civitas* must begin with a radical restructuring of community organization and political power.

To appreciate the role of the Federal Government in this system, it is necessary to step back for a moment and consider the probable behavior of urban-regional development in a national perspective. In the future, most interregional migration will take place between and among urban fields. We have arrived at a stage where the development of urban fields has become a zero-sum game. It is no longer possible for everyone to win a part in the national sweepstakes. The winners in this game are likely to be urban fields which have attractive environments and high levels of public services. Economic differences are declining as a factor in the locational decisions of families.[74]

If this picture is correct, questions of equality in the distribution of life chances are going to acquire increasing importance in national life, and the Federal Government will have to devote a good deal more attention to these questions than it has done. In situations where population gains in favored urban fields must be compensated by losses in other urban fields, a situation of great instability is created. In the losing regions, private investment becomes riskier and, consequently, more costly. If sustained over a period of time, this investment behavior will further reduce the attractiveness of the losing area and accelerate population decline, raising the per capita costs of public services and allowing physical deterioration to continue. Once such a process has been started, it becomes extremely difficult to reverse it. To avert an outcome that is likely to affect a growing number of urban fields, the Federal Government may have to undertake huge subsidy programs to counteract the disinclination of private business to invest in declining areas or to seek such other measures as may effectively reduce the rate of interregional migration. Since neither policy can be guided by objective or even widely accepted criteria of right and wrong, urban politics in America is bound to become increasingly acrimonious.

Two centuries of spectacular and steady urban growth are drawing to a rapid and ignoble close. We, who have been raised on a belief in individualism and minimal government, find ourselves challenged by the necessity to evolve a public philosophy capable of countering the disruptive consequences of our pioneering heritage. The invisible hand not only is invisible; it never existed. We are beginning to learn at great pain how to live with this reality.

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[74] For persuasive evidence on this point for as early as the 1950's, see Paul J. Schwind, Migration and Regional Development in the United States, 1950-1960. Chicago: The University of Chicago, Department of Geography, Research Paper No. 133, 1971. See also Chapter 10 of Stanback and Knight, *op. cit.*

Chapter 4

LAND-USE INSTITUTIONS IN THE WASHINGTON-BALTIMORE REGION — A MIRROR FOR METROPOLITAN AMERICA

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INTRODUCTION

The analysis presented in this paper is exploratory. It was designed to reveal problems and serious lacks of knowledge about land-use planning and development in the Washington-Baltimore region. A draft paper was prepared on the basis of interviews and research conducted in April and May 1972. This draft was distributed to a selected group of Government officials, private developers, and land-use experts for review. An open-session review of the paper was conducted at the Washington Center for Metropolitan Studies on June 6, 1972. Criticism made at this review gave the basis for preparation of the final draft.

The objective of this paper is an analysis of the operations of institutions that determine land use and an assessment of what is known about them. Our emphasis has been placed on agents of development, although we recognize the importance of other institutions like the legal structure and financial practices. Although we seek generalizations about urban land-use institutions in the Nation, we have analyzed one metropolitan region, the Washington-Baltimore region on the eastern seaboard of the United States. This was chosen not only because of its accessibility to the authors, but because it is growing rapidly and shows the operation of land-use institutions in sharp relief. It also illustrates effectively many different public and private interests: national and local economic and environmental, black and white, traditional and emerging.

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*Deceased.

Because the analysis concentrates upon land-use institutions, a zonal concept of a metropolitan region is used instead of traditional conceptions of the citylike site and situation, city and hinterland, core and suburb. The metropolitan region disclosed is far larger than that of tradition, census enumeration, or scholarly concept. It is, however, an everyday reality to those whose decisions determine future land use.

Although both the Washington and the Baltimore areas of this metropolitan region are growing, the former has the more vigorous growth. Most of the succeeding references will be drawn from the Washington area; generalization, however, will apply to both sections.

THE GROWTH OF THE CITIES

The Physical Setting

The Baltimore-Washington region has a slightly north-of-center location on the Atlantic seaboard of the United States. Baltimore, the senior of the two regions, owes its initial growth to a position at the head of navigation on Chesapeake Bay, the largest estuary of the eastern United States. Washington, now the dominant center, was arbitrarily chosen for urban development, taking account of its central position to the original 13 States of the 18th century. Washington has proven to be a remarkably well-chosen site for its function as Capital. Within a radius equal to the distance between Washington and Miami, Fla., all of the States east of the Mississippi River are included, plus the more important parts of the Missouri Basin and Great Plains States. These States include 74 percent of the Nation's people. Of more recent interest is Washington's emergence as a center for administration of international affairs. For this function it has a location central to the North and South American continents, North and West Africa, and Northern and Western Europe. Sectionally, the Baltimore-Washington region is the southern tongue of a much larger region on the eastern seaboard dominated by urban centers that has been called megalopolis.

The land on which the history of Washington and Baltimore has run its course, and which is now being developed at its most rapid rate since the cities were founded, has a variety of physical types from ancient mountains to the natural swamps of the Coastal Plain. Much of the landscape is flat or gently rolling; only a very limited area has slopes averaging more than 15 percent (fig. 4.1). Washington and Baltimore are centered at the boundary between the relatively flat country of the Coastal Plain and the rolling lands of the old-rock Piedmont. Brackish-water estuaries reach deep into the Coastal Plain to the very door of both cities.

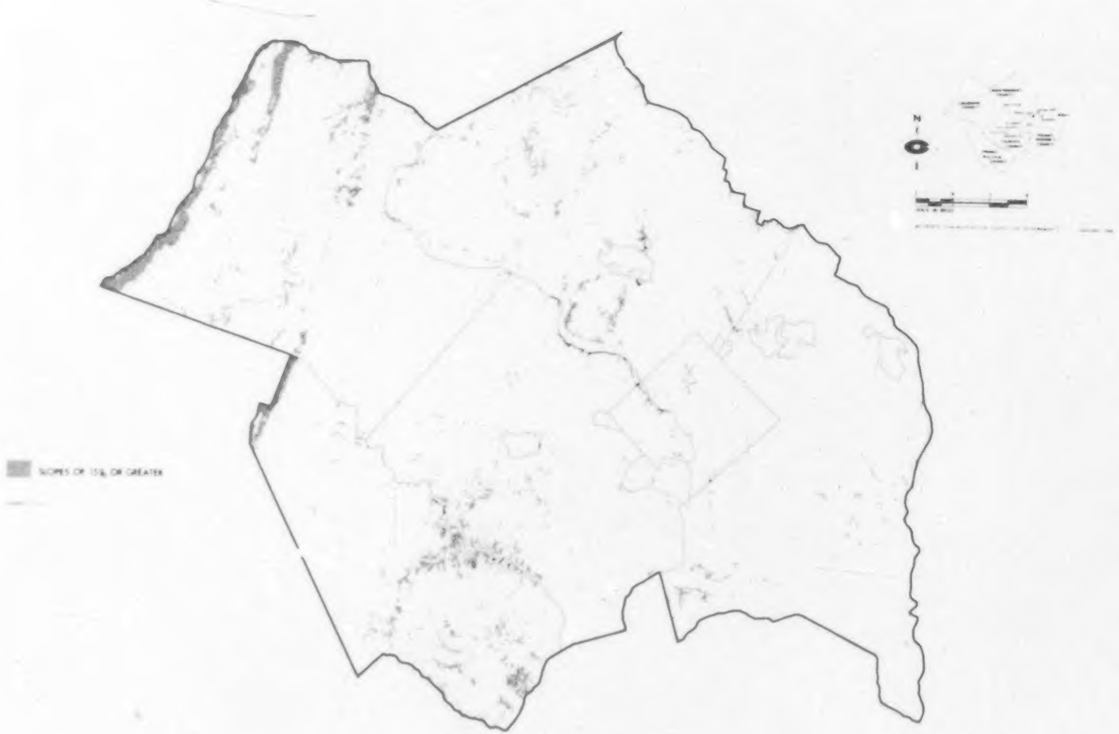
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Figure 4.1 Slope in the Washington Area

The natural landscape of the metropolitan area has a pleasing variety and content. A significant percentage of it is wooded, largely with an oak-pine-tulip poplar association (fig. 4.2). The waterways of the estuaries, with their many aspects, are supplemented by unusual reaches of river valley, like the gorge of the Potomac, which reaches to the center of Washington. Westward there is near-mountain wild land on the northern extension of the Blue Ridge and the edge of the Allegheny Plateau. American history has added many sites of educational and patriotic interest to these natural features, like Williamsburg from colonial times, Harper's Ferry of pre-Civil War days, sites connected with the Civil War like Antietam and Manassas, and the many facilities associated with the Federal Government.

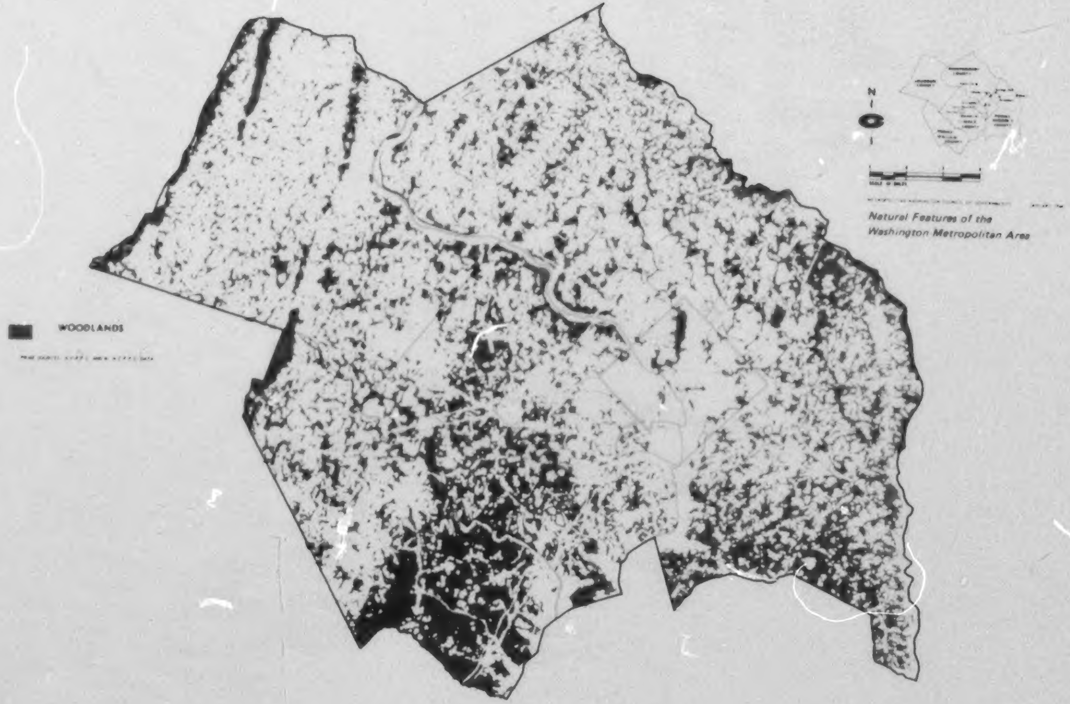
How the City of Washington Developed

The land of the Washington-Baltimore metropolitan region has the imprint of more than 300 years of history upon it. The metropolitan region of today has been shaped within the last three decades. However, it cannot be understood without reference to previous events. Washington and Baltimore differ notably in their histories, but the historical sketch of Washington that follows gives some indication of the way in which land use has developed in the metropolitan region.

Washington started in the District of Columbia, a 10-mile square of land carved out of the States of Maryland and Virginia. Until very recently, the major land-use decisions in the District have been made by Members of Congress, officers of the U.S. Army Corps of Engineers, and their friends and associates among local realtors, bankers, utility executives, and corporate lawyers. After President Washington's appointment of Pierre Charles L'Enfant to prepare the original plan for the city, American Presidents played a minimal direct role in planning the development of the National Capital. The general public has also played a minor role until recent years, and its influence on land-use planning has been felt more in suburban jurisdictions than in the District of Columbia.

It is Congress that sets the District budget, appropriates money for the construction of Federal and local public buildings and monuments, and determines the Federal contribution to local improvements. Over the years, Congress has determined the street and highway system, imposed limitations on the height of buildings and established public planning bodies, and set their rules and policies. Among them were the McMillan Park Commission (1901), the Fine Arts Commission (1910), the Public Buildings Commission (1916), the National Capital Planning Commission (1924), the National Capital Housing Authority (1934), the Redevelopment Land Agency (1945), and the Washington Metropolitan Area Transit Authority (1967).

The links between Congress and the Army Corps of Engineers are legendary. Indeed, they go back to L'Enfant, who was a major of engineers in the Continental Army. The District's water supply system is constructed and


WOODLANDS
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Natural Features of the
Washington Metropolitan Area

Figure 4.2 Woodlands in the Washington Area

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operated by the Corps. In 1878, when Congress established the presidentially appointed three-commissioner form of government for the District, it stipulated the commissioner in charge of public works was to be an officer in the Corps of Engineers. Because this commissioner controlled streets, highways, parks, sewers, and local public buildings, the Corps of Engineers had virtually complete authority over the principal physical determinants of land use in the District of Columbia until 1967, when the mayor-council form of government replaced the three commissioners.

While many of the decisions that structured and paced development were fashioned by local leaders, the power and authority to take official action remained largely with Congress and the Corps of Engineers.

These land-use decisionmakers wanted a city which was attractive to the Federal Government, private residential developers, and middle- and upper-income residents. They wanted a clean, beautiful city, well ordered in its street layout and convenient for vehicles.

To achieve this city they have focused their almost exclusive attention (until the social crisis years of the 1960's) on the location of public buildings, the street system, bridges and highways, water supply and sewage disposal, parks and tree planting, automobile storage for tourists and commuters, slum clearance, and rapid transit.

From the last decades of the 19th century until the 1950's, the controlling interests in land-use planning also sought, usually successfully, to confine blacks to carefully circumscribed parts of the city, or to remove them from central to outlying locations. As recently as 1947, General U.S. Grant III, chairman of the National Capital Park and Planning Commission, stated publicly that "the colored population dispossessed by playgrounds, public buildings, parks and schools" would be relocated to a section of the city "in the rear of Anacostia."[1]

The basic land form has been most important in determining the location and direction of different kinds of development in the city of Washington and its metropolitan area.

Bisecting the metropolis and the District of Columbia at its center is the fall line separating plateau from coastal plain. To the south and east of that line, on the coastal plain, residential development has tended to be more modest and inexpensive than on higher ground to the north and west of the line. And until World War II, the Potomac River acted as a southern barrier that helped to keep the main thrust of development moving toward Maryland.

The early preference of official and well-to-do white Washingtonians to settle on the higher ground to the north and west, resulted in that section of the city getting the lion's share of public facilities and services. Thus the extensive physical improvements undertaken in the 1870's by the Territorial Board of Public Works under Alexander Shepherd largely bypassed the

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[1] Constance McLaughlin Green, ***Washington: Capital City,*** **1879-1950: Princeton University Press, Princeton, N.J., 1963, p. 493.**

Southwest, the Navy Yard section in Southeast, Capitol Hill, and the Northeast.

The underlying factor governing the timing, pace, and scale of Washington's development has been the ever-enlarging role of the Federal Government in American life and the world community. The role of the Federal Government has expanded in two ways. It has grown in great spurts as military and economic crises have made extraordinary demands on it. And it has expanded gradually but steadily as the American people have urbanized and as the United States and the world have been shrunk in size by the transportation and communications revolution of the last century and a half.

The timing of Washington's land development history is notably a record of response to crisis. Crises that stand out sharply in Washington's growth are the Civil War, World War I, the Great Depression, World War II, the Korean war, the Vietnam war, the "cold wars" of the 1950's and 1960's and the domestic social crisis of the 1960's. Crisis-induced growth has tended to submerge the local community, take away its best manpower, overtax its facilities and public works, break down its transportation system, diminish congressional confidence in local abilities, and overwhelm existing instruments of land-use planning. Typically, these crises have led to the creation of new land-use planning institutions under Federal control.

The wrenching growth of the Civil War years during the next decade destroyed the city's self-government, briefly concentrated power in the hands of a Presidential appointee, Alexander Shepherd, led subsequently to the establishment of the commissioner form of government and made the U.S. Army Corps of Engineers the principal arbiter of public works.

The next major crisis was World War I, which made Washington a national war center and overwhelmed it with a mushrooming population growth of 50 percent in 18 months. There were severe shortages of housing, office space, water and sewage facilities, and school buildings.

In response to the delayed demands from wartime shortages and continued high Federal employment, the 1920's, despite minimal new population growth, brought a major building boom of apartments, luxury hotels, office buildings, and single-family houses. A 5-year school building program was launched, and Congress voted $50 million to begin construction of the Federal Triangle, a major concentration of Federal offices.

One of the most noteworthy developments influencing land use in Washington in the 1920's was the emergence of the Capital as the first automobile-dominated city in the country. In a city of under a half million population, automobile registration reached 173,600 in 1930. Sixty-four percent of all persons who rode to work used automobiles. The Highway Department set about felling trees and widening streets to meet the growing traffic crisis.

Traffic and parking problems worsened, however, as Washington in the 1930's enjoyed an employment boom based on the country's Great Depression and the ensuing growth of the Federal Government. Population growth exceeded that during another decade since the Civil War. While Washington grew by 36 percent, population decline or slow growth characterized all other major American cities except Los Angeles. As the Federal Triangle was completed, the number of Federal Government jobs increased by over 160 percent, from 63,000 in 1933 to 166,000 in 1940, and private building jumped from $7 million in value annually to $35 million in the same period. Eighteen hundred apartment houses, 2,300 row houses, and 800 office buildings were built in the city, and suburban development got a strong start.

While gas rationing in World War II brought some relief to Washington traffic congestion and a boost to bicyclists and bus companies, and while rent control averted the bitterness that characterized city-Federal relations during World War I, Washington was again overworked, overcrowded, and undersupplied. Even before the war began for the United States, between April 1940 and the fall of 1941, population grew from 663,000 to 750,000.

The stage was set for another postwar development boom. This time, however, there was a big difference. The District was largely built up. It had relatively little undeveloped land left to accommodate an expanding population. National housing programs, veterans programs and highway programs, combined with long-deferred and pent-up local needs and desires, fueled a massive movement to Maryland and Virginia suburbs. Growing American involvement in world affairs and expanding Federal involvement in national affairs also made Washington the most rapidly growing large metropolitan area in the Nation.

It was a growth that departed from the geometric physical layout given to the Capital by l'Enfant 150 years before. In addition to being physically disordered, this growth was racially restricted. Suburbanization was largely for whites. It was not until the mid-1950's that the U.S. Supreme Court ruled racially restrictive housing covenants unenforceable. Another dozen years passed before the passage of fair housing laws. The result was that in the two decades after World War II, the whites took advantage of suburban opportunities to acquire more modern, spacious, less expensive, lower density housing, served by better schools and new shopping centers with lots of parking. During this period blacks moved into most of the housing stock in the District east of Rock Creek Park. It is only since 1967 that a rapidly growing black middle-income population has joined in the suburban movement.

The city's leaders were aware of the mouting suburban trend and eager to catch up with needs accumulated during the war; seeking to stimulate downtown business and thus increase District revenues, they engineered passage of the Redevelopment Act of 1945. They intended to remove many blacks to the "rear of Anacostia," and bring suburbanites downtown to shop and work by building high-speed highways, revitalizing the central business district and building new cultural institutions that would reinforce the commercial magnetism of downtown.

But the suburban boom was too strong, blacks too resistant and aspiring, superhighways too difficult to bring through built-up areas, investment too hard to attract to the old commercial downtown. Washington's center ceased to dominate the metropolis commercially. It became only one center in a multicentered metropolitan region. Although it continued much of its dominance in Federal employment, it lost that role in the commercial sector. While the District's population changed in two decades from 65 percent white to 71 percent black, poverty declined and the Capital remained a predominantly middle-income city.

In addition, and more importantly, Washington was acquiring a new kind of dominance as the transactional heart of a national and world capital metropolis. When World War II overtook Washington, the city was primarily the American seat of government and a regional commercial center. But two decades later, in a rapidly shrinking world, it had attracted from New York and Chicago many headquarters of major American interests and had become a public finance, news, and diplomatic center for the non-Communist world. The challenge that lay ahead was regional and interstate in scope, beyond even the "exclusive jurisdiction" that the Constitution gave Congress over the District of Columbia; it was also beyond the narrower purposes of the planners, unofficial and official, who had shaped the city for over a century and a half.

As one looks back over nearly two centuries of Washington's land-use history, a few events and attributes stand out. One is the sporadic, piecemeal, and almost unpredictable manner in which public powers for comprehensive planning have been applied. A second is the crisis-related, steplike nature of development. Projections and forecasts have had much less use in the real world of Washington development than the manner of response to crises. Third, even though the basic employment pattern has been dominated by the Federal Government, private interests have dominated land-use development—even the public part of land-use planning. Finally, the jurisdiction of public planning has always lagged geographically behind the actual extent of development in the metropolitan region.

TWO CONCEPTUAL MODELS OF THE CURRENT LAND-USE DEVELOPMENT PROCESS IN THE WASHINGTON-BALTIMORE METROPOLITAN AREA

The planning, the decisions, and the work that eventually become crystallized into a given land use results from a very complex process that includes direct and indirect influences, public and private. In addition, the components in the decisionmaking process are likely to be present in differing combinations of interest and influence, according to geographical areas and political jurisdictions. Descriptions of the process in any metropolitan region can quickly yield a mountain of hopelessly intricate detail. We shall therefore use two conceptual models to generalize the land-use development process of the metropolitan region: (1) a matrix of decisionmaking institutions and their interests; (2) a zonal model that reveals the differing combinations of these decisionmaking influences under given conditions in the region.

AN INSTITUTIONAL MATRIX

In the matrix which follows 10 agents whose decisions affect land use in the Washington-Baltimore metropolitan region are listed, five of them private and five public (table 4.1). For each of these a notation has been made as to perception of interest, short range and long term; means for action (financial or legal); type of action possible and past response in cooperation with other agents. The Federal and State Governments each contain many different agencies whose decisions and actions affect land use in the metropolitan area (fig. 4.3). Their policies or actions are not always consistent or even compatible. For this paper the Federal and State presences have been integrated in each case, because our interest at this point is in showing the relations among different types of institutions rather than in the intricacies of structure within any one.

Obviously the agents of land use must be considered in their relation to the functions served by specific dedications of land use. In the Washington-Baltimore metropolitan region, five basic functions of a regional nature may be recognized for the dedication of land: transportation, basic employment,[2] recreation-esthetic-environmental, residential use, and commercial services.

In addition to these, some dedications of land use for extraregional functions are found; for example, national parks, monuments, forests, military and other reservations. Certain other functions served by land uses are socially and economically very important, but not as major "consumers" of land. They are: educational facilities, utilities (communications, electricity, gas, petroleum pipeline, etc.), and local and regional governmental facilities.

DECISION SEQUENCES

It will be recognized without discussion that some of these functions are public and others private. Land-use management in the Washington-Baltimore metropolitan region therefore is a mixture of public and private decision. Public land-use decisions and private decisions have different purposes, although those purposes are related. The sequence in which decisions and actions are carried out therefore is an important determinant of the mix of land uses in a given area, the cost and efficiency of public services, the profit of private construction firms, and many other matters dependent on land use.

In general, there are two possible sequences of such decisions: (1) a sequence showing initially strong public participation, which we call the "balanced" sequence; and (2) a shortcut sequence that has initially weak public public participation (fig. 4.4). The balanced sequence is as follows:

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[2] Includes Federal employment, industrial, and basic commercial employment.

Table 4.1 Metropolitan Land Use Agents

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AGENT / PROCESS	PERCEPTION OF INTERESTS		MEANS FOR ACTION		TYPE OF ACTION POSSIBLE	RESPONSE IN COOPERATION	
	SHORT RANGE	LONG TERM	FINANCIAL RESOURCES	LEGISLATIVELY SANCTIONED REGULATION OR CONTROL		LATERAL	VERTICAL OR HIERARCHICAL
FEDERAL	D.C. MANAGEMENT SOCIAL CHANGE TRANSPORTATION (CONSERVATION GENERAL)	LEADERSHIP IN ENVIRONMENTAL QUALITY, GENERAL WELFARE, ADVANCEMENT OF SPECIAL SERVICES	THE MONEY TREE	SUPREME COURT MANAGEMENT PROGRAMS REGULATION PROGRAMS	LEADERSHIP IN MANAGEMENT FOR CONSERVATION & SOCIAL OBJECTIVES OWNERSHIP	NOT APPLICABLE	RELATIONS WITH ALL ENTITIES BELOW
STATE	INTEGRATION OF SERVICES FOR STATE TERRITORY REINFORCING LOCAL INSTRUMENTALITIES	EXPANDING SERVICES AT HIGHER EFFECTIVENESS	SOME	LEGISLATION, APPELATE COURT DECISIONS MANAGEMENT	DETERMINES CIRCULATION PATTERN CONSERVATION POLICY; JURISDICTION OWNERSHIP	SOME BUT NOT CONSISTENT	LESS EXTENSIVE THAN FEDERAL-OFTEN BYPASSED BY FEDERAL
COUNCIL OF GOVERNMENTS REGIONAL AUTHORITIES ETC.	COOPERATIVE LEADERSHIP	MORE EFFICIENT INSTITUTIONS	FEW AND INADEQUATE	REVIEW: NO CONTROL	RESEARCH, DELEGATED MANAGEMENT; PLANNING	NONE	AS GIVEN AUTHORITY BY PARTICIPATING ENTITIES
COUNTY	EFFICIENT, EFFECTIVE UTILITIES & OTHER SERVICES; CONTROL	FISCAL GROWTH OR STABILITY	SOME	ZONING; SUBDIVISION REGULATION, REGULATION OF SERVICES: CODES COMPREHENSIVE PLANNING	OWNERSHIP, MANAGEMENT, TAXATION, UTILITY SERVICE	WEAK	EXTENSIVE UPWARD AND DOWNWARD
MUNICIPALITY	EFFICIENT, EFFECTIVE UTILITIES & OTHER SERVICES; CONTROL	FISCAL GROWTH OR STABILITY	POOR	ZONING, ETC., AS FOR COUNTY	OWNERSHIP, MANAGEMENT, TAXATION, UTILITY SERVICE	SOME	EXTENSIVE UPWARD AND DOWNWARD
BANKS, CORPORATIONS, DEVELOPMENT COMPANIES	PROFITS	ENVIRONMENT FOR PROFITS	LARGE	FULL WITHIN LIMITED AREA	DETERMINE OCCUPANCE; LOBBYING	ADEQUATE	AS PERCEIVED IN SELF INTEREST
NEIGHBORHOOD	ENVIRONMENTAL QUALITY; STABILITY	STABILITY; ENVIRONMENTAL QUALITY	FEW OR NONE	VERY LITTLE	ORGANIZED OBSTRUCTION, LOBBYING	POTENTIALLY SOME	WEAK
INDIVIDUAL PROPERTY OWNER	ENVIRONMENTAL QUALITY; CAPITAL APPRECIATION	CAPITAL APPRECIATION AND ENVIRONMENTAL QUALITY	AMPLE	FULL IN LIMITED AREA	DETERMINES OCCUPANCE; PUBLIC WELFARE BY PHILANTHROPY	SOME	AS REQUIRED BY LAW
PROPERTYLESS INDIVIDUAL	SELF INTEREST; FAMILY ENVIRONMENT	DIVERSE	FEW	LEASEHOLDS ONLY	PHYSICAL DESTRUCTION & ECONOMIC OBSTRUCTION, LOBBYING	CRISIS	AS REQUIRED BY LAW
PHILANTHROPIC ORGANIZATIONS AND INDIVIDUALS	EFFICIENT SERVICES	SOCIAL CHANGE; SOCIAL STABILITY; ENVIRONMENTAL QUALITY	AMPLE	ONLY AS REAL PROPERTY OWNER	RESEARCH COMMUNICATIONS RESEARCH, EDUCATION	LITTLE	WITH ALL ENTITIES. BY CHOICE

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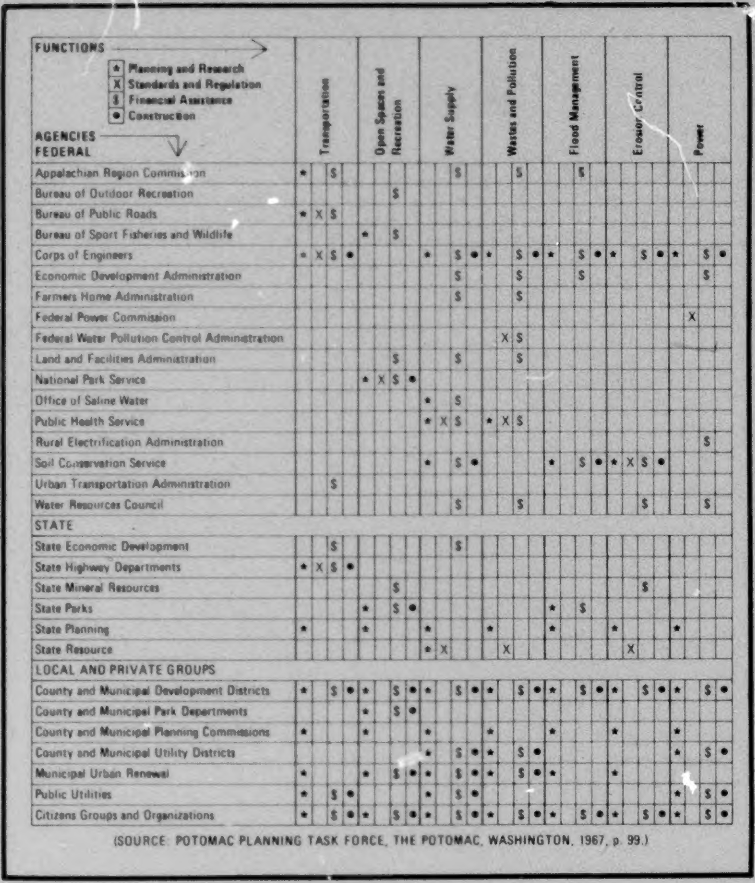

FUNCTIONS →

★ Planning and Research
X Standards and Regulation
$ Financial Assistance
● Construction

AGENCIES FEDERAL	Transportation	Open Spaces and Recreation	Water Supply	Wastes and Pollution	Flood Management	Erosion Control	Power
Appalachian Region Commission	★ $		$	$	$		
Bureau of Outdoor Recreation		$					
Bureau of Public Roads	★ X $						
Bureau of Sport Fisheries and Wildlife		★ $					
Corps of Engineers	★ X $ ●		★ $ ●	★ $ ●	★ $ ●	★ $ ●	★ $ ●
Economic Development Administration			$	$	$		$
Farmers Home Administration			$	$			
Federal Power Commission							X
Federal Water Pollution Control Administration				X $			
Land and Facilities Administration		$	$	$			
National Park Service		★ X $ ●					
Office of Saline Water			★ $				
Public Health Service			★ X $	★ X $			
Rural Electrification Administration							$
Soil Conservation Service			★ $ ●		★ $ ●	★ X $ ●	
Urban Transportation Administration	$						
Water Resources Council			$	$		$	$
STATE							
State Economic Development	$		$				
State Highway Departments	★ X $ ●						
State Mineral Resources		$				$	
State Parks		★ $ ●			★ $		
State Planning	★	★	★	★	★	★	★
State Resource			★ X	X		X	
LOCAL AND PRIVATE GROUPS							
County and Municipal Development Districts	★ $ ●	★ $ ●	★ $ ●	★ $ ●	★ $ ●	★ $ ●	★ $ ●
County and Municipal Park Departments		★ $ ●					
County and Municipal Planning Commissions	★	★	★	★	★	★	★
County and Municipal Utility Districts			★ $ ●	★ $ ●			★ $ ●
Municipal Urban Renewal	★	★ $ ●	★ $ ●	★ $ ●	★	★	
Public Utilities	★ $ ●		★ $ ●				★ $ ●
Citizens Groups and Organizations	★ $ ●	★ $ ●	★ $ ●	★ $ ●	★ $ ●	★ $ ●	★ $ ●

(SOURCE: POTOMAC PLANNING TASK FORCE, THE POTOMAC, WASHINGTON, 1967, p. 99.)

Figure 4.3 Key Government Agencies in the Washington Area and Some of Their Functions

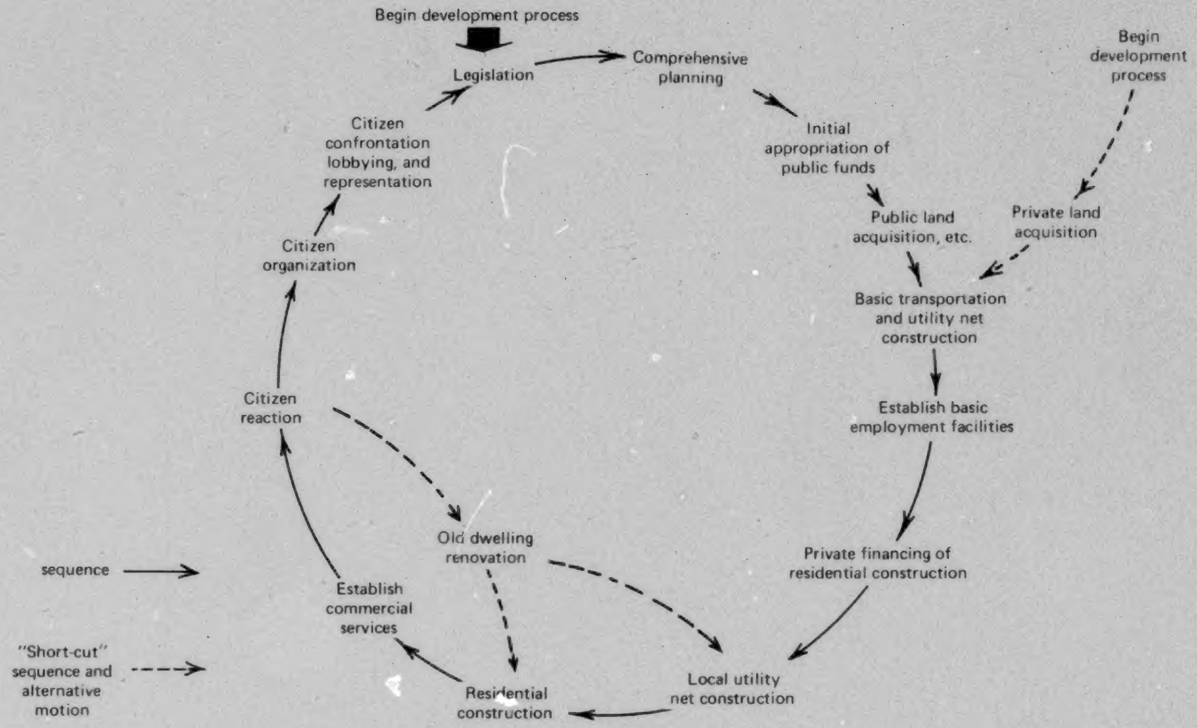
Begin development process
Legislation
Comprehensive planning
Initial appropriation of public funds
Public land acquisition, etc.
Begin development process
Private land acquisition
Basic transportation and utility net construction
Establish basic employment facilities
Private financing of residential construction
Local utility net construction
Residential construction
Establish commercial services
Citizen reaction
Citizen organization
Citizen confrontation lobbying, and representation
Old dwelling renovation
sequence
"Short-cut" sequence and alternative motion

Figure 4.4 The Local Sequence of Land Use Development

- Comprehensive planning and authorization of public regulation of land use;
- Initial appropriation of public funds;[3]
- Reservation of lands for all planned public uses within the development jurisdiction (development district,[4] subdivision, county, or other). These public uses include transportation, recreational, esthetic, and environmental purposes, and reservations for extra regional needs and utilities;
- Construction of transportation arteries and minimal utilities (water, sewage, and electricity);
- Establishment of basic employment units (Federal Government, manufacturing, or other);
- Private financing of proposed residential construction;
- Establishment of residential-family use units (residential subdivision); and
- Establishment of commercial service units (e.g., shopping centers).

It is obvious that the third and most important step in the above sequence of land-use decisions and dedications cannot be carried out without the establishment of two other public functions: comprehensive planning for the development area and public regulation of land use. Such planning or regulation has been found only infrequently in the metropolitan region.

Typically, comprehensive planning and public regulation come after another sequence of development that might be called shortcut development. It is typified by the following sequence of actions:

- Private land acquisition;
- Private financing of proposed residential construction;
- Construction of transportation routes and laying on of electricity and water;
- Establishment of commercial service units.

Although the shortcut sequence has been characterized as having initially weak public participation, strong public participation is eventually established in those areas which undergo shortcut development. Public reaction provides the energy in a "feedback loop" to introduce land-use regulation, public land acquisition, and the other characteristics of the first, or "strong," sequence. Thus both sequences end with a balance of public and private participation, but there is a great difference between them. In the second sequence the cost of those actions that must be undertaken by public agencies becomes enormously greater, the range of alternatives for public action drastically limited, and the effectiveness of public services considerably less. It is rather like the difference between sustained yield forestry, on the one hand, and "cut out and get out" lumbering, with succeeding land rehabilitation, on the other.

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[3] Appropriations, of course, are needed at several times in the sequence. All subsequent appropriations are ignored in order to simplify this description.

[4] See pp. 183-184.

Three features common to both sequences of development are worth noting:

- Both public and private participation in decisions determining land use is found in each sequence; strong public participation is inevitable at some point. The difference lies in the timing and in the cost effectiveness of public participation for the services only it can provide;
- By far the most important land use in terms of area under current practices (36 percent) is for residence; and
- The process of constructing residences and developing individual family use land units has continued for many years, and even for centuries in some jurisdictions within the metropolitan region. Taken as a whole, the residential construction industry therefore has a long-term as well as a short-term interest.

Table 4.2 summarizes the interests of the nine principal agents influencing the sequential steps in land-use development. Among the interesting things brought out by this summarization are:

- The dominant units in land acquisition and ownership have been corporations, individual owners, and the Federal Government;
- All units of government share an interest and responsibility for the development of the transportation net;
- Utility development is divided between public and private responsibilities;
- Counties and municipalities have the principal land-use regulation responsibilities;
- Comprehensive planning is something less than strong;
- Private corporations and individuals have far-reaching roles in the process of land development;
- Neighborhoods and propertyless individuals are represented in the process only through citizen reaction that may initiate action on a neglected step in governmental participation and responsibility

RIVATE PARTICIPATION IS IN THE HANDS OF MANY ENTREPRENEURS

Although the basic transportation and utility nets are mainly determined by public decisions, the patterns of land development in the Washington metropolitan area have been largely determined by the individual actions of thousands of private entrepreneurs acting as individuals or in corporations. This is because of the dominance of residential development in the land-use picture. These private entrepreneurs assess the market, assemble the land, secure public authorizations, obtain financing, and establish the land uses and activities they sponsor within the framework of existing or anticipated public systems of

Table 4.2 Activity of Nine Agents in Land Development: Washington-Baltimore Metropolitan Region

1–PRIMARY INTEREST
2–LESS SIGNIFICANT THAN 1.

	LAND AQUISITION AND OWNERSHIP	COMPREHENSIVE PLANNING	REGULATION	TRANSPORT NET DEVELOPMENT	UTILITY NET DEVELOPMENT	BASIC EMPLOYMENT	RESIDENTIAL SUBDIVISION	COMMERCIAL SERVICES	CITIZEN REACTION "FEEDBACK LOOP"
FEDERAL GOVERNMENT	1	2	2	1		1			
STATE	2	2	2	1	2				
REGIONAL AUTHORITY		2		2	1				
COUNTY	2	2	1	1	2				
MUNICIPALITY	2	2	1	1	2				
CORPORATION	1			1	1	1	1	1	
NEIGHBORHOOD									1
INDIVIDUAL OWNER	1					2	1	1	1
PROPERTYLESS INDIVIDUAL									1

roads, utilities, community facilities, and amenities.[5] The severe fragmentation of land-use decisions is illustrated by the fact that there are more than 600,000 different landownerships within the District of Columbia, the six inner counties, Alexandria, and the other inner municipalities.

Inasmuch as these entrepreneurs are competitive, association and cooperation among them is only for special purposes and loose at best. The closest cooperation appears to exist between the developers of modest to large residential subdivisions and those specializing in commercial services. The key to commercial services appears to be the location of a supermarket by a firm of regional or national reputation. The strongest supermarket chains no longer have to look for their sites. Residential builders and developers seek supermarkets and other popular retail outlets in order to strengthen their developments.

Although fragmentation is still typical of the industry in 1972, a trend toward consolidation appears to be strong. Very small entrepreneurs (25 or fewer houses annually) are likely to participate indefinitely in development, but the middle-sized firms are being merged with larger corporate operations of national scope or into affiliated groups with national membership. The reasons given for this trend lie mainly in the enormous capital required to tide an enterprise over the long period that now ensues between development proposals and the completion of construction.[6]

PUBLIC INSTITUTIONS ARE FRAGMENTED

Public institutions for the planning, regulation, and management of land use in the Washington-Baltimore area are fragmented. Most of the 15 cities and counties comprising the Metropolitan Washington Council of Governments have their own land planning, zoning, and code enforcement programs.[7] For the most part, local governments with their planning commissions are the main public institutions for control of land use.[8]

Public institutions which have land-use influence in the Washington metropolitan area are highly fragmented. The extent of this fragmentation is illustrated by a list of those which have some multicounty responsibilities. They include:

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[5] See the First Report of the Citizens Advisory Committee to Study Zoning in Central Business Districts and Transit Station Areas, *Toward Development of Better Central Business Districts in Montgomery County*– Maryland-National Capital Park and Planning Commission, Silver Spring, Md., 1972–mimeo, p. 7; and Metropolitan Washington Council of Governments, *Area Wide Land Use Elements*, Clearinghouse for Federal Scientific and Technical Information (now National Technical Information Service), Springfield, Va., 1971 pp. 12-24.

[6] John Canning, Acting Senior Vice President, Levitt & Sons, Review Conference, June 6, 1972.

[7] See Washington Metropolitan Council of Governments, *Metropolitan Washington Regional Directory* (Washington, 1972), pp. 8-24.

[8] Interview with Royce Hanson, Commissioner, Maryland-National Capital Park and Planning Commission, Mar. 27, 1972.

- Maryland-National Capital Park and Planning Commission (Montgomery County and Prince Georges County Planning Boards);
- National Capital Planning Commission (District of Columbia and Federal Government Planning);
- Northern Virginia Planning District Commission (Arlington, Loudoun, Fairfax, and Prince William Counties; cities of Falls Church, Fairfax, and Alexandria; towns of Herndon, Manassas, Leesburg, Manassas Park, and Vienna);
- Northern Virginia Regional Park Authority (Arlington and Fairfax Counties and cities of Alexandria, Fairfax, and Falls Church);
- Northern Virginia Transportation Commission (same jurisdictions as (4));
- Washington Metropolitan Area Transit Commission (created by interstate compact for regulation of carriers in the metropolitan area);
- Washington Suburban Transit Commission (Montgomery and Prince Georges Counties);
- Washington Suburban Sanitary Commission (water supply and sewerage for most of Montgomery and Prince Georges Counties); and
- Interstate Commerce Commission, State highway, planning, environmental and other agencies (Virginia and Maryland).

Agencies whose responsibilities cover a larger number of jurisdictions include:

- Washington Metropolitan Area Transit Authority responsible for planning, developing and financing rail rapid transit in the Washington region;
- Metropolitan Washington Council of Governments (land use, open space, environmental, and transportation planning. Includes District of Columbia; Montgomery and Prince Georges Counties and municipalities of Bowie, College Park, Greenbelt, Rockville, and Takoma Park, Md.; Fairfax, Arlington, Loudoun, and Prince William Counties and municipalities of Alexandria, Falls Church, and Fairfax, Va.); and
- U.S. Army Corps of Engineers (shoreline jurisdiction, and water supply for metropolitan region).

Regional planning agencies related to the Baltimore metropolitan area include the following:

- Regional Planning Council (Anne Arundel, Baltimore, Carroll, Harford, and Howard Counties; Baltimore City);

- Delmarva Advisory Council (Kent, New Castle, and Sussex Counties, Del.; Caroline, Cecil, Dorchester, Kent, Queen Annes, Somerset, Talbot, Wicomico, and Worcester Counties, Md.; and Accomack and Northampton Counties, Va.); and
- Governor's Council for Appalachian Maryland (Alleghany, Garrett, and Washington Counties).

In addition to these multicounty agencies, there are 77 counties and numerous municipalities, the five State governments, and the District of Columbia Government.

Zonal Model of Location of Development

As our brief history and description of the current land-use decision process has shown, the determination of land use in the Washington-Baltimore metropolitan region may be described in terms of an interface between public and private actions. However, the "mix" of the expression of public and private powers is not everywhere the same in the metropolitan area. The metropolitan region may be viewed as structured in zones of development, with different relationships among the responsible institutions in each. Four zones are hypothesized (fig. 4.5).

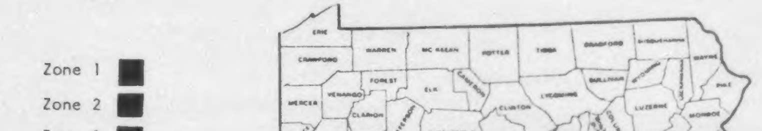

Figure 4.5 Zones of the Washington-Baltimore Region

ZONE I

Zone I is comprised of the geographically central jurisdictions of Washington and Baltimore. For Baltimore this is Baltimore City, and for Washington it is the District of Columbia, Arlington County, Va., and the cities of Alexandria and Falls Church, Va. Zone I is characterized by relatively dense occupance. Very little land remains for initial residential, commercial, or basic employment uses. Land-use changes are almost entirely in the form of redevelopment from prior uses to higher dense occupance. A considerable amount of land has declined in economic productivity or social usefulness because of the obsolescence of structures, careless maintenance, vandalism, and abandonment. Citizen reaction has been strong and even violent, on occasion, in recent years. Governmental control of land use and initiatives for redevelopment are strong, but the evolution of a well-balanced land-use structure is hampered by high land values, high demolition costs, and the reluctance of private financial institutions to support redevelopment.

The two parts of this zone remain very nearly stationary in population, the Baltimore center declining a little and the Washington center slightly increasing. They make up less than 1 percent of the total land area of the metropolitan region as here defined (table 4.3).

ZONE II

This zone is made up of the eight counties surrounding the two city centers.[9] These two rings of counties comprise about 10 percent of the land area of the metropolitan region. They are now more populous than the two city centers combined, and were the most rapidly growing sections in the 1960's. Although some land remains in all of these counties for initial residential and urban development, governmental control of land use has become strong, with local government powers equaling those of Zone 1. Private development must proceed under the guidance of public planning.

The development of these counties, and the evolution of their institutions during the 1960's, was promoted by the completion of the beltways around each of the central cities. These routes dispersed former arterial corridor traffic into ring patterns. The 1971 "sewer moratorium" in Prince Georges and Montgomery Counties, Md., and in Fairfax County, Va., are examples of the strength of the Government hand in this zone.[10] Another example is the 1972 decision by Loudoun County to postpone an extensive planned residential development because of inadequate infrastructure.

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[9] For Washington, Loudoun, Fairfax, and Price William Counties in Virginia, and Montgomery and Prince Georges Counties in Maryland. For Baltimore, Howard, Anne Arundel, and Baltimore Counties.

[10] On May 30, 1972, the Fairfax County Board of Supervisors adopted a plan to regulate development in the northern quarter of Fairfax County by allotting public sewerage capacity in that area, through 1977, by yearly increments to specified types of development including "public benefits uses" (*Washington Post*, May 31, 1972).

Table 4.3 Population and Land Area of the Four Zones of the Washington-Baltimore Metropolitan Region

	1960 POP	% of 1960 TOTAL	1970 POPULATION	% of 1970 TOTAL	% CHANGE 1960–70	LAND AREA SQUARE MILES	% of LAND AREA	GROWTH RANK	
ZONE I									%
WASHINGTON	1,028,572	19.1	1,052,504	16.1	+ 2.3	110	.3	WASHINGTON ZONE II	+68.9
BALTIMORE	939,024	17.4	905,759	13.8	– 3.5	78	.3		
SUBTOTAL	1,967,596	36.5	1,958,263	29.9	– .5	188	.6	ZONE II TOTAL	+54.3
ZONE II								MARYLAND ZONE III	+35.5
WASHINGTON	1,048,038	19.5	1,770,442	27.0	+68.9	2,249	7.0	BALTIMORE ZONE II	+33.4
BALTIMORE	735,214	13.6	980,527	14.9	+33.4	1,272	3.9		
SUBTOTAL	1,783,252	33.1	2,750,969	41.9	+54.3	3,521	10.9	ZONE III TOTAL	+33.1
ZONE III								VIRGINIA ZONE III	+23.5
VIRGINIA	56,030	1.0	69,180	1.1	+23.5	1,319	4.1	DELAWARE ZONE IV	+17.6
MARYLAND	234,009	4.4	316,989	4.8	+35.5	2,003	6.2		
SUBTOTAL	290,039	5.4	386,169	5.9	+33.1	3,322	10.3	ZONE IV TOTAL	+13.9
ZONE IV								VIRGINIA ZONE IV	+97
VIRGINIA	323,975	6.0	355,424	5.4	+ 9.7	8,695	26.9	PENNSYLVANIA ZONE IV	+ 9.2
WEST VIRGINIA	199,277	3.7	198,504	3.0	– .4	6,813	21.0	MARYLAND ZONE IV	+ 8.4
MARYLAND	494,119	9.2	535,748	8.2	+ 8.4	5,529	17.1	WASHINGTON ZONE I	+ 2.3
DELAWARE	138,846	2.5	162,248	2.5	+17.6	1,544	4.8		
PENNSYLVANIA	193,126	3.6	210,899	3.2	+ 9.2	2,733	8.4	WEST VIRGINIA ZONE IV	– .4
SUBTOTAL	1,349,343	25.0	1,462,823	22.3	+ 8.9	25,314	78.2	ZONE I TOTAL	– .5
TOTALS	5,390,230	100.0	6,558,224	100.0	+21.8	32,375	100.0	BALTIMORE ZONE I	– 3.5

ZONE III

This zone is comprised of the next tier outward, north and south, of seven counties.[11] These counties are becoming the scene of some of the most active subdivision development in the region. The governmental hand has not been strong up to this point, and the relatively low populations of the counties has dampened the citizens' reaction to shortcut development. Land assembly and development are proceeding in all counties as developers, following the line of least resistance, seek a rapid turnover of their capital. The 1971 sewer moratoriums in Zone II unquestionably quickened interest in the development of at least five of these seven counties.

ZONE IV

Zone IV is made up of the outermost tiers of about 60 counties extending into eastern West Virginia, southern Pennsylvania, Delaware, and Seaboard, Virginia. Within this zone private land purchase is common for weekend homes, vacation sites, investment, and speculation. A large share of this activity is generated within zones I and II of the region. It is obvious that this activity in the counties of southeastern Pennsylvania, Delaware, and northeastern Maryland are shared with Philadelphia. Activity in some of the central Virginia counties is also shared with the less-vigorous center of Richmond. Without any question the counties of this zone are functioning parts of the metropolitan society. The central zones draw heavily on the community to meet their increasing demands for outdoor recreation, if nothing more. In a very real sense zone IV is an important part of the open space of Washington and Baltimore, but of course it is not open space for everybody. Local government attention to land-use development characteristically is weak in this zone.

INTEGRATED OR UNIFIED PLANNING

Recognition of the extent and structure of the modern metropolitan region of Washington clearly indicates that efficient and responsible development does not stop with a local option for a balanced sequence of development measures. It is also essential to have a structure that will apply the balanced sequence within the region as a whole, where and when it is needed in the public interest.

Furthermore, equity to all groups within the whole region will require steps that appropriately are not included within the local development sequence. Among these are the planning and establishment of the regional infrastructure

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[11] Culpeper, Fauquier, and Stafford Counties, Va.; and Charles, Carroll, Frederick, and Harford Counties, Md.

(major arterial highways and beltways, etc.), and the allocation of resources sectorally (e.g., equitable development for income classes).

Figure 4.6 illustrates the cyclic process from the point of view of the metropolitan region. It may start either with legislatively determined planning, or voluntary cooperation among local public and private interests. The former has been labeled "integrated," and the latter "unified" to distinguish the two. A choice between application of the shortcut and the "balanced" local development sequence is indicated to show the real world of development. Thus far in the Washington-Baltimore metropolitan region, only a partial application of unified development (voluntary cooperation) has been made. The most serious gap in the loop under existing arrangements is the allocation of resources sectorally. Except through the national programs of the Federal Government, as administered both by Federal Government agencies and States, no structure for economic and social sectoral allocation exists. Low-income housing, educational facilities, access to recreational and cultural facilities, and access to transportation are examples. There is no program or structure that fully treats the metropolitan region as such.

DEFINITION OF MAJOR PROBLEMS IN LAND-USE DEVELOPMENT

A definition of the problems of the metropolitan area may be made in two ways: (1) a classification according to social and economic objectives; (2) an analysis of the frictions and missing pieces in the system of development.

Problems From the Point of View of Social and Economic Objectives

Our study assumes certain social and economic objectives. They include the provision of basic employment, adequate housing, commercial services, transportation, utilities and other public services, and the satisfaction of certain psychological needs not met in the other objectives. The latter might include the minimization of nuisances, such as noise, water, and air pollution; provision of esthetically pleasing surroundings; ready contact with nature and provision for sports. The provision of educational and cultural facilities and the preservation and maintenance of cultural monuments must also be assumed. Insofar as possible, all this should be undertaken in a manner that anticipates citizen reaction and affords smoothly functioning channels for that reaction. Furthermore, it should provide incentives and equity for the entrepreneurs who assist in development.

How well does the present process of land development in the metropolitan area meet these objectives? One may get some insights into the adequacy of the current system by examining mobility, housing, environmental enhancement and basic employment support.

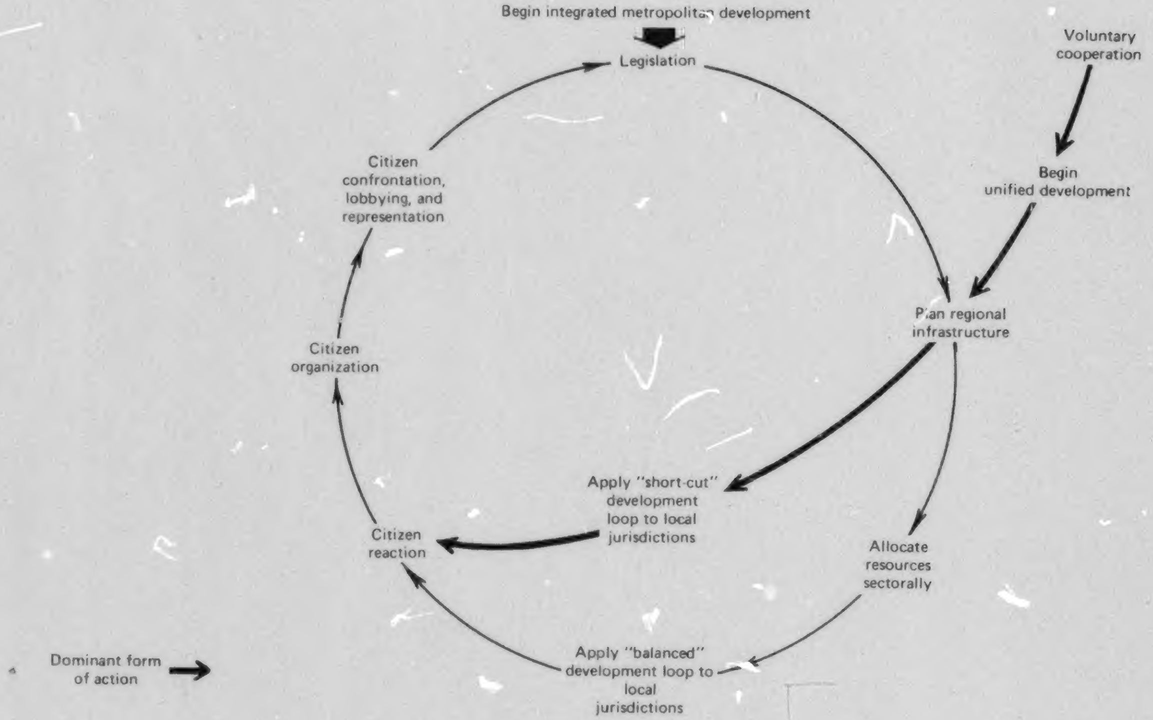
Begin integrated metropolitan development
Legislation
Voluntary cooperation
Begin unified development
Plan regional infrastructure
Allocate resources sectorally
Apply "balanced" development loop to local jurisdictions
Apply "short-cut" development loop to local jurisdictions
Citizen reaction
Citizen organization
Citizen confrontation, lobbying, and representation
Dominant form of action

Figure 4.6 Geographically Integrated or Unified Metropolitan Regional Development

EFFICIENT MOVEMENT OF PEOPLE IN AN INCREASINGLY MOBILE AGE

Efficient movement of people means their easy mobility to and from local and outlying places of recreation as well as to and from places of business and commercial service centers. Although urban area residents are showing more and more their preference for convenience in their lives, land-use trends are not convenience oriented, and they also add to environmental problems. Land development that pushes weekend recreation even farther into the periphery of the metropolitan region and encourages dependence on automobiles may be cited as parts of this problem, as well as locational policies for basic employment that continually increase the commuting range.

THE PROVISION OF ADEQUATE HOUSING IN AN ENVIRONMENT COMPATIBLE WITH LONG-TERM PUBLIC INTEREST

In general, the system of land development operating in the Washington area would seem to have a good record on housing. However, when seen in terms of providing adequate housing for all classes of society, black and white, lower income and middle income, transient and permanent, there are gaps in what generally appears to be a good record. This is particularly true for lower-income and lower-middle-class housing and even more true for the black components of these groups. Furthermore, few residential subdivisions in the past have been compatible with long-term environmental needs. This applies to almost all classes of housing. Since housing is by far the most important single user of land in the metropolitan region, residential development practices are the keys to environmental conditions.

THE SATISFACTION OF ESTHETIC AND ENVIRONMENTAL NEEDS IS INADEQUATE

All classes in the metropolitan area could have a better environment; again, certain groups are even less favored than others, such as middle- and lower-middle-income groups and the residents of the current more densely settled zones I and II, particularly zone I. A recent report by the Federal Environmental Protection Agency emphasizes: (1) the absence of regional policies to integrate land-use and environmental quality goals; (2) the separation of water supply and waste management programs; (3) the inadequate provision for new water supply and waste management facilities which are required.[12]

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[12] U.S. Environmental Protection Agency, *National Capital Region Water and Waste Management Report* (Washington: EPA, 1971), p. II-3. See also Paul S. Hughes, *An Analysis of Alternative Institutional Arrangements for Implementing an Integrated Water Supply and Waste Management Program in the Washington Metropolitan Area* (Washington: Institute for Defense Analysis, 1971).

THE PROVISION OF ADEQUATE BASIC EMPLOYMENT TO SUPPORT A JOB STRUCTURE THAT INCLUDES ALL GROUPS

The Washington area is more stable than most other metropolitan areas because of the dominant component of Federal Government employment, but again the inadequacy of provision for certain groups must be noted. In this case it is the young, black, lower-income groups who are not adequately covered in the existing arrangements in the metropolitan area. Although land-use policies have a limited direct influence on this problem, their general indirect impact over the long range can be considerable.

The Current System of Development as a Problem

The familiar problems we have partly indicated are, of course, only surface phenomena; they are only the result of deeper lying problems inherent in the system itself. The development of a great city like Washington-Baltimore is a dramatic event, viewed in perspective. Here is the true geographical frontier of the late-20th-century America. It may not have the same human touchstones as the advance of the western frontier in this country in the 19th century, but it has some of the same elements. Tremendous human energies and financial resources are involved. It is pluralistic; many people are playing for high stakes. However, we may see a decided unity in it.

The major energies of current metropolitan development are centrifugal, as seen from Washington, and concentrated on an advancing front which is concentric to the center. Its advance guard is made up of individuals acquiring land for speculative or recreational purposes (zone IV). The main forces are occupied with the construction of arterial roads, basic utilities, residential subdivisions, and commercial service centers in zone II, and in parts of zone III. This tide, or concentration of energies and developmental resources, is always moving outward with its "frontier." Behind are left the problems of consolidation: recovering environmental values or satisfying environmental needs; rationalizing the transportation network, and all the other actions that must be organized when people are in such high density on the land that they cannot avoid taking account of each other.

Viewed another way, land use on the advancing frontier of settlement in a metropolitan area is determined by the highest bid. However, the true costs of this determination are not reflected until the later period of consolidation, when the social and financial costs are levied upon those who live behind the frontier. If land values become great enough, decay can result, as in zone I. Here citizens and their society pay a price in terms of foregone amenities and subjection to nuisances. Alternatively, they may choose to incur greater transportation costs, but of course this option is not available to everyone.

There are four important things to emphasize about the current process of land-use development:

- Even though it is pluralistic, it does have unity in its methods of impact on the developing fringe or frontier of the metropolitan area;
- Its main energies are focused on a limited, but widely distributed, geographical area;
- As far as any given local area is concerned, it is special purpose and relatively short term; most builders are somewhat like miners in this respect; and
- It follows that public objectives for community development and private objectives for land development often have been dissimilar, and where objectives are unlike, cooperation in the common interest encounters uncertainty, delay, and frustration.

These observations may be translated into the definition of two further problems: (1) Local cooperation among the agents of development; and (2) cooperation among a hundred different governmental jurisdictions.

Local Cooperation Among the Agents of Development

Both public and private interests consider the present process of development as unpredictable and conducive to a short-term view. Local governmental administrations change and the commitments of one may not be honored by its successor. The existing legal structure in all jurisdictions of the region does not provide for an orderly sequence of development that all its agents can depend upon. Responsible private developers who have had long experience in the metropolitan area complain how inaccessible the public planning process is to them. They note examples of unrealistic public decisions, as in the inappropriate reservation of commercial or industrial sites that could have been avoided by public-private cooperation in planning. They also complain of summary decisions which can cripple their operations overnight, like the recent moratorium on sewer development in Prince Georges County and Montgomery County, Md. Public practices thus seem to encourage a short-term view.

The length of time required for approval of private development plans in some jurisdictions is another source of complaint. Official clearance of development proposals may require from 2½ to 10 years. The capital carrying cost incurred during a 10-year process of gestation for a development proposal adds a very significant sum to the total capital investment. The problem concerns expediting decisions on plans, making joint public-private commitments on capital programing and orderly progress once commitments have been made. It has been suggested that such progress would be hastened by providing for full-time, adequately paid professional positions on the regulatory commissions and at other current bottlenecks in the programing of development.

These observations of friction in the process apply particularly to zones I and II, where the expression of public interest is strong. This situation, however, may cause a developer to transfer his interest to zone III, a move he might postpone for some time under other conditions.

Cooperation Among a Hundred Governmental Jurisdictions

The institutions that must cope with the public interest on the advancing frontier are sadly fragmented, even though the major process of land-use development in the metropolitan region has unity.

This is particularly true for those parts of the metropolitan region in the wake of development which are undergoing the process of consolidation and incurring the associated social costs. The principal powers affecting land use are in local jurisdictions. If one may cite a political analogy, the metropolitan area is like the collection of duchies, counties, principalities, and kingdoms of Germany before Bismarck took office. The only organizations expressing joint interest are partial in their coverage, geographic jurisdiction, sectors of interest, authorizations, and powers.

The essence of this problem is that planning for metropolitan land-use development, if it is to be efficient and equitable in the incidence of cost and benefits, sectorally and geographically, should be multiple purpose and a matter of regionwide concern. This is not unlike the problems faced by this country in river basin development 20 to 30 years ago. Until about 1930 a single-purpose, geographically fragmented approach characterized our river development practices and institutions. Between 1933 and 1950 it was demonstrated beyond any doubt that multiple-purpose, integrated basin development gave a far superior yield in benefits at strikingly reduced costs. Multiple-purpose, integrated basin planning is now standard throughout the world for this type of development.

If land-use development in a metropolitan region is seen as an activity in which multiple-purpose planning is unavoidable and action in one jurisdiction or geographical area affects others, then the present system must be regarded as seriously faulty. The problem then becomes one of determining the metropolitan equivalent of institutions that have been able to produce outstanding results in river-basin planning and water development.

POTENTIALLY BENEFICIAL CHANGES IN INSTITUTIONS (ALTERNATIVES)

There would appear to be three types of institutional alternatives for future land-use development in the Washington-Baltimore metropolitan region:

- A continuation of current institutions, with local additions and improvements;
- A regional agency for Washington and one for Baltimore, chosen by the component jurisdictions of their metropolitan areas, or a single

consolidated agency for the two regions. In either case they would include jurisdiction over zones III and IV; and

- The assumption of greater powers for land development by the States of Maryland and Virginia.

Each of the three alternatives could produce some improvement over the current situation; each has certain merits and disadvantages. The three will be discussed briefly, recognizing that variations or different forms for each of the alternatives are possible.

Continuation of Current Institutions, With Improvements

Since the persistence of the status quo is always a probable course, continuation of current land development institutions should be listed as one of the alternatives for the region. Problems associated with this course have been discussed earlier in this paper. Some solutions for those problems have already been proposed and acted upon within the existing framework for land development. We shall review them briefly in an assessment of what might be expected from current institutions. This assessment will be conducted under the topics of (1) unified planning, and (2) balanced sequential development, preservation of environmental values, and equitable housing construction.

Unified Planning

Eleven years ago a plan was published for the future of the metropolitan region.[13] This has been referred to as the "wedges and corridors" plan. The old and principal arterial routes leading to and from the central city of Washington were envisioned as the corridors, with wedges of open space in between (fig. 4.7). The new subway system for the Washington Zone I and Zone II areas now under construction is one element in this plan (fig. 4.8).

After a decade of influence it is generally conceded that this "wedges and corridors" plan has not been successful. The region's population has grown much faster than projected, employment has grown even faster than population, construction of transportation facilities has been slow, and open space acquisition has been too small to have much effect on the form and sequence of regional growth. It now appears that sewerage construction in the next 15 years will encourage urban development in the green "wedges" originally planned as open space. Meanwhile, open-space acquisition in the "wedges" has been of modest proportions (fig. 4.9).

One weakness of the plan lay in its dependence on the invisible planning of private entrepreneurs, whose decisions were dominant in the shortcut sequence of development. The controls exercised by the county governments and the

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[13] *A Policies Plan for the Year 2000: The Nation's Capital*, National Capital Planning Commission and National Capital Regional Planning Council, Washington, 1961.

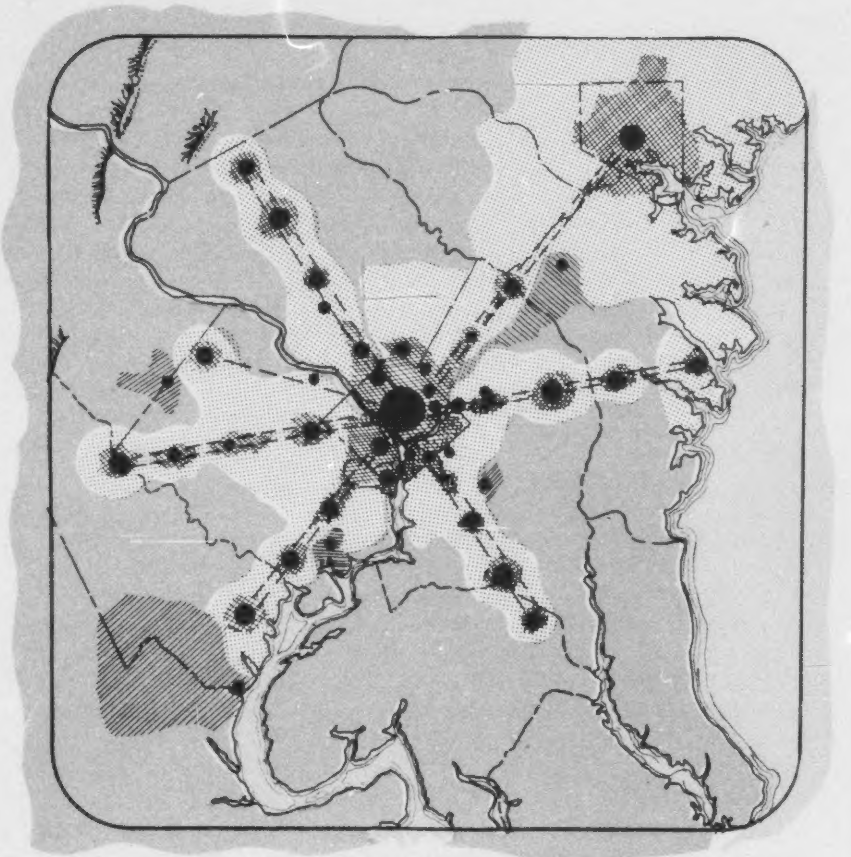
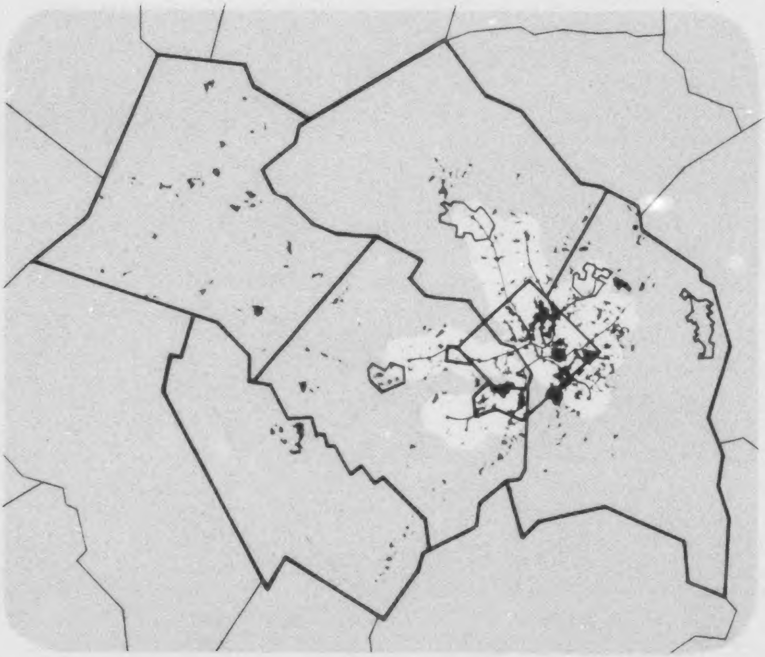


Figure 4.7 The Radial Corridor Plan



☐ 10 minute feeder bus service area

Figure 4.8 Adopted Transit System of the Washington Area

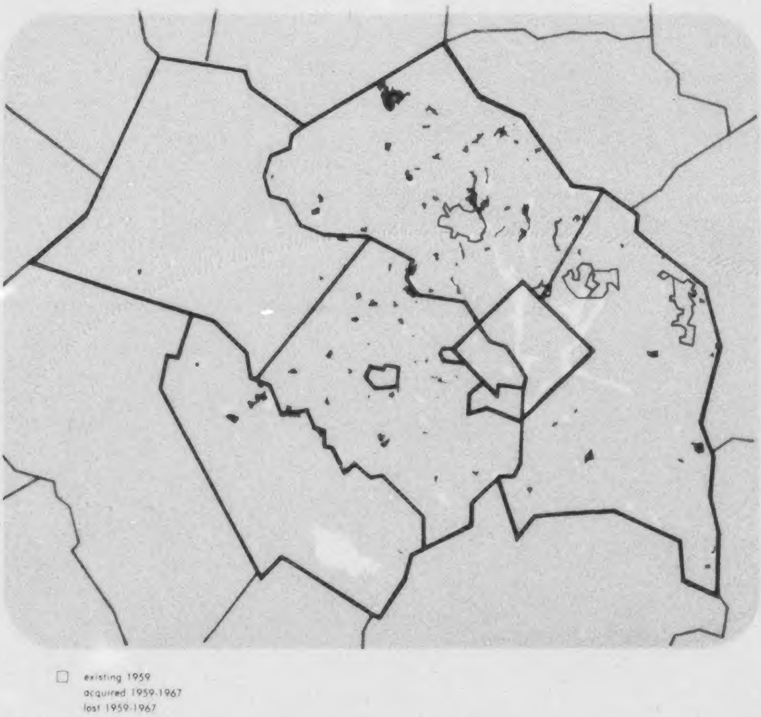

☐ existing 1959
acquired 1959-1967
lost 1959-1967

Figure 4.9 Changes in Open Space Land 1959-1967

rigidity of public planning often made public-private cooperation difficult, from the point of view of the private entrepreneur, and to be avoided if possible.

The Metropolitan Washington Council of Governments has recently attempted to improve the planning and land development process under current institutions, through its EMPIRIC modeling project. This model has components representing public and private influences on land development trends. The model simulates the interface between population and employment projections, land-use data, major private developments, and public policies and actions. Included among the latter are transportation, water and sewer services, zoning and density constraints, and open space policies.[14] The EMPIRIC model appears to have been, and potentially is, a useful tool aiding a unified view of metropolitan area problems. Its usefulness, however, so far appears to be limited to zones I and II.

The greatest influence of the "wedges and corridors" plan seems to have been a strengthening of the position of zone I, the central city of Washington. The reinforcement of the arterial routes radiating from the center under the plan seems designed to preserve at all costs the traditional city pattern, which has been fought for by zone I interests over the years.

This is the point on which the validity of this planning concept may be most seriously questioned.

The late-20th century is an era in which completely new means of mobility and communication are available. It is also a time when the effective metropolitan area is to be reckoned in thousands of square miles. In such a setting, is the old Manhattan type of city center-suburban pattern economically efficient and socially desirable? The current Metropolitan Washington area plans seem to point in the affirmative.

The Federal Government has added the weight of its voice to reinforcing the central zone I and raising its density. For a brief period in the 1950's the Federal Government encouraged the development of satellite centers in zone II under defense planning stimuli, but that policy seems to have ended quietly and decisively.

A final most serious weakness of current unified metropolitan regional planning is its almost total disregard of zone III and zone IV. Today these are undeniable parts of the metropolitan region.

A Balanced Sequential Development, Preservation of Environmental Values, and Equitable Housing Construction

The key to effective action on the environment, as we have suggested, is the selection of a "balanced" development sequence rather than the shortcut sequence. This shortcut sequence leaves public land acquisition and other public service preparations until late in the development process, after a public opinion crisis may have been reached. How well has the present system met the need for using the balanced sequence?

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[14] Metropolitan Washington Council of Governments *Areawide Land Use Elements,* Clearinghouse for Federal Scientific and Technical Information (now National Technical Information Service), Springfield, Va., 1971, pp. 12-24.

Curiously, the most effective answers, and the best examples of selection and application of the balanced development sequence, have been provided by private entrepreneurs. The "new town" concept of a balanced community, planned from the outset, is a very good illustration of the selection of this course. The Washington metropolitan area has several good examples of new-town development, perhaps the best known of which are the Rouse Co.'s Columbia, midway between Baltimore and Washington, and Robert Simon's Reston[15] in Virginia. Both these new towns are comprehensively planned, with provision for all aspects of community life, basic employment, and the needs of different classes of housing. Environmental and esthetic considerations and provision for outdoor and indoor recreation have been taken into account in a thoroughly responsible manner, whether or not one agrees with details. If all community development were undertaken in the manner of new towns such as Reston and Columbia, many of the failures of the present system of land-use development in the metropolitan region would be avoided.

Unfortunately, there is very little new-town development, as exemplified by Reston and Columbia, on the advancing frontier of urbanization in the metropolitan region. Financial and other resources of near-governmental dimensions are required to pursue development of this kind successfully. The large majority of private developers active in the Washington area, and the large percentage of lands they have under development, are not open to this type of action.

Theoretically a consortium of developers of very small means could undertake the same type of plan, but so far the shorter range interests of the smaller entrepreneurs appear to have made such a course unattractive. The application of the balanced sequence by this means, therefore, is far from prevalent in recent land-use development. Theoretically, the present trend toward merger between modest-sized firms and large corporations could open up further opportunities for experiments of this kind. However, the informed consensus suggests that the problems of financing new-town development are now even more formidable than they were when Columbia and Reston were started.

Two other possibilities may be considered for the introduction of the balanced sequence within the present system. Perhaps the most important one is the "development district" concept first suggested by Marion Clawson in 1960.[16] A "development district" could be formed of a county or any part of it. In it a county agency would assemble land, coordinate public improvements for developments, sell or lease excess landholdings to the private sector for development, control development in accordance with master plans, and produce detailed designs to help guide private development. The agency would have power of eminent domain, to be placed under the legislative control of the county government.

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[15] Now Gulf-Reston.

[16] Marion Clawson, "Suburban Development Districts," *Journal of American Institute of Planners*, May 1960. See also Henry Bain, *The Development District*, Washington Center for Metropolitan Studies, 1968.

The "development district" could have the same operational effects as a new town, if applied to a large-enough area. Although it lacks some of the power of the new-town concept, it is more flexible and presumably could be applied anywhere in the metropolitan region. In the absence of integrated or unified planning for the metropolitan region, however, the establishment of "development districts" is dependent on local option, and will probably take place after the shortcut sequence has already begun land development.

For the older areas of consolidation, where problems have become serious enough to cause the entry of a strong public voice in land-use development, several new approaches are possible. The old zoning instruments have largely proven inadequate, and revisions are being considered. One of these is the so-called "sector planning" technique now being recommended in Montgomery County, Md. This technique would control high densities by issuing permits only when detailed design plans are submitted. These plans must also conform with parking, open space, access, and other standards of public interest and convenience. Public and private interests would participate in designing a long-term public capital improvement program that would serve as a working guide for private development interests, as well as the development of public services.[17]

An important part of the suggested approach in Montgomery County aims at simplifying the current complex and time-consuming relation between the private entrepreneur and the county government. Incentives would be provided for land assembly and intensive development in specified areas, and zoning changes would be simplified but still kept under adequate controls. Once a "sector" plan had been agreed upon, private developers would be assured of the stable public agency outlook that is now lacking.

These improvements, again, appear particularly applicable to zones I and II, where consolidation and redevelopment are most important.

A Regional Agency

The foregoing discussion suggests that the existing system of land-use development in the Washington metropolitan area could solve the problem of establishing balanced sequence development as far as individual local jurisdictions are concerned. However, the effectiveness of such improvements in the system would be much reduced if there were not some means of unifying or integrating development on a regional basis.

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[17] Citizens Advisory Committee to Study Zoning in Central Business Districts and Transit Station Areas, *Toward Development of Better Central Business Districts in Montgomery County, Maryland.* National Capital Park and Planning Commission, Silver Spring, Md., 1972.

One possibility is the formation of a regional agency, for which the Federal Environmental Protection Administration's (EPA) proposal of a Regional Council may serve as a prototype. The Regional Council has been suggested by the EPA as a replacement for the existing Metropolitan Washington Council of Governments. It would have a membership elected by popular vote and receive its authorization for operation from a Federal-interstate compact. It would have the power to implement as well as to plan regional policies, particularly in water supply and waste management. Under the auspices of the Regional Council a new Regional Environmental Service Corporation is proposed. It would acquire, construct, and operate wholesale facilities for water supply and waste management within the region.[18]

A parallel proposal contemplates the establishment of an interstate Potomac River Basin Commission. The Potomac River Basin Commission proposal does not, of course, cover the metropolitan region as a whole, but it is mentioned because of its overlapping coverage with the Regional Council concept. The Regional Council also is partial in its coverage from the point of view of total land-use development in the metropolitan region. Zones III and IV are not included in the proposal, although their exclusion is not prohibited by any technical reason. In addition, the council would have only a partial authorization in matters affecting land-use development.

In spite of its limited coverage, opposition to the council concept seems to be strong, and the possibility of adoption, if pursued, is one that must be reckoned in terms of a number of years.

Stronger State Participation in Unified Planning

Within recent years many States have taken a more active role in land-use planning and environmental protection activities that were once left to local governments. Some States, like the three southern New England States and New Jersey, are already on the threshold where urban problems and State problems are almost indistinguishable: Maryland and Delaware would seem to be in a similar position, although they are not yet as well organized to treat metropolitan affairs as the southern New England States. Although Virginia has a larger area, our delineation of the Washington-Baltimore region shows that its urban interest is still vital.

Probably for these basic reasons a perceptible shift toward more State influence on land development in the metropolitan region has been evident in recent years. New leverage is being exerted in the field of environmental protection, including air pollution control, water pollution control, and solid-waste disposal. State power is likely to increase in these activities in response to continuing Federal Government pressure upon the States. Other factors are increasing public reaction that demands State control policies, and the impact of growth-induced crises in sewage disposal, pollution incidents, water shortages, brownouts, and fiscal imbalances.

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[18] U.S. Environmental Protection Agency, *National Capital Region Water and Waste Management Report*, Washington, 1971, p. II-3. See also Paul S. Hughes, *An Analysis of Alternative Institutional Arrangements for Implementing an Integrated Water Supply and Waste Management Program in the Washington Metropolitan Area*, Institute for Defense Analysis, Washington, 1971.

Already the States have a major hand in the planning of the metropolitan region through the basic transportation routing, particularly in the beltways and the arterial highways running into the city centers. In the case of Washington, a new outer beltway is well into the process of planning. State environmental policies are also beginning to have general impact, as in the case of the Virginia Water Control Board's reactions to the U.S. Army Corps of Engineers' plans for the Rappahannock River. Virginia and Maryland are also considering statewide land development controls.

The extension of State powers in a manner that would promote unified or integrated planning for these States within the Washington-Baltimore metropolitan region seems feasible and logical. It seems the only way in which zones III and IV can be incorporated in any integral fashion, within a reasonable time, into the land development process of the metropolitan region. The States in each case already have jurisdiction over the counties of zones III and IV; it is only a question of recognizing the metropolitan character of these counties and the desirability of legislating at an early date for a balanced sequence of development within them.

There would remain a problem of coordination for the metropolitan region between the States themselves and between them and the Federal Government, which still has a major hand in the affairs of the District of Columbia and dominates basic employment in the region. Indeed, this route may be the best way to a regional metropolitan agency, even if it were not the initial objective.

Desirable Characteristics of Metropolitan Regional Land-Use Development

The metropolitan region as here conceived is a phenomenon of recent evolution in our society. It is obvious that planning and development for land use could be improved greatly by extending the authority of existing institutions, especially within the States, and by making use of concepts already tried.

The region that actually exists, however, is vast and complex by comparison with anything that has been recognized for urban planning and management in the past. It will probably take many years to evolve a satisfactory and smoothly cooperative set of institutions that safeguards public and private interests. The history of the Washington metropolitan region suggests that these institutions must be capable of an effective crisis response, without undue waste or delay. Rigidity and uncertainty need to be eliminated from public practice; public and private institutions should encourage a long-term view by practice as well as by plan. The application of policy should be uniform throughout the region; development "havens" using the shortcut sequence should not be permitted.

Finally, land development should be guided by comprehensive (but flexible and responsive) plans that give equitable treatment to all social sectors in the region. We are a long way from the realization of such a set of institutions but significant advances have been made, in thought and deed, within the last two decades.

RESEARCH OPPORTUNITIES

It is obvious that better unified planning and development is possible and that an improved sequence of development steps can be achieved. But there are many aspects of the evolution of better government and better cooperation among land-use development agents in a metropolitan region where improved knowledge is needed. Better knowledge can shape a more satisfactory evolution of development institutions from public and private points of view, as well as hastening it.

Thirteen research topics in four groups are suggested: institutions for land-use planning and guidance, criteria for settlement patterns, environmental compatibility of land use, and evaluation and monitoring techniques.

Institutions for Land Use Planning and Guidance

- What are the economics of sequential development? What are the costs, over the long term, of public services in the balanced sequence as compared to the shortcut sequence? What are the comparative returns to private developers in the two sequences? Can a meaningful overall cost-benefit comparison be constructed?
- What are the true equity issues in metropolitan land-use development? Considering the metropolitan region as a whole, under present institutions of development, who loses and who gains over the long term? Over the short term?
- What restructuring of State government would provide for proper management of metropolitan regions within the State? How can the needed regionalization of the State administrative structure be achieved while preserving the line functions of central staff agencies?
- What are the possible means of improving interstate cooperation in metropolitan management and achieving a stable structure for such cooperation?
- What are the values, interests, and decision processes of the several types of private entrepreneurs undertaking or influencing land development? How are their interests and efficiencies affected by public action? What is the area of their most effective contribution from a long-term public point of view?
- In view of the likely continuance, for some time, of the shortcut sequence of land-use development, what strategies can be evolved to produce: (*a*)

effective neighborhood organizations; (*b*) public-private development corporations; (*c*) class action judicial proceedings; (*d*) other means of an early introduction of public objectives into land development?

- How do existing legal sanctions and procedures contribute to excessive cost, uncertainty and rigidity in the land development process of the region? Analysis could include:
  - (*a*) State constitutional provisions, State code and case law regulating the private developer;
  - (*b*) Law governing public land reservation, acquisition, and development;
  - (*c*) The use and influence of tax law;
  - (*d*) Procedural implications of environmental impact reviews required by law.
- What are the influences of both public and private financing practices on the progress of land development in the region? How do they contribute to the development problems outlined in this paper? What improvements are feasible? What is the geographical pattern of a composite development budget (all sources, public and private) for the region during a recent year?

Criteria for Settlement Patterns

- Under current technical conditions and considering current social values, what are the economics and social accounting of central city strengthening, and further evolution of a traditional city structure, compared with the economics and social accounting of a more decentralized multicentered regional city?
- What are the criteria for the location of Federal Government operations in the metropolitan area? Are the criteria now used compatible with modern transportation and communications technology? What are the potentialities for further diversification of basic employment in the metropolitan region?
- What, if any, extensions of land development models are appropriate? Examples of land-use models include the EMPIRIC studies by the Metropolitan Washington Council of Governments, the gaming techniques pioneered by the Washington Center for Metropolitan Studies, Envirometrics, Inc., the Massachusetts Institute of Technology's Urban dynamics studies, and other urban modeling experiments.

Environmental Compatibility of Land Use

How do current development practices contribute to national energy consumption, and possible energy crises?

Evaluation and Monitoring Techniques

What are the dynamics of land use in the four zones? Can an effective, inexpensive regional system of monitoring land-use change be established?

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Chapter 5

LAND-USE RESEARCH ISSUES SUGGESTED BY A NATIONAL URBAN GROWTH STRATEGY

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A national urban growth strategy is slowly emerging in the United States. In comparison with France, Britain, and other countries, the development is belated, to be sure, but the evidence is mounting and unmistakable. The first formal steps toward such a strategy were taken with the passage of Title VII of the Housing and Urban Development Act of 1970, and with the submission to Congress of the first National Growth Report.[1] Although the report was clearly inadequate and roundly criticized in most quarters, subsequent pronouncements indicate that there is already a more sophisticated understanding of what such a report should be about.[2]

In the pages that follow we shall examine the kind of research questions that ought to be explored if there is to be a national urban growth strategy, that is to say, if there is to be a deliberate and relatively coherent set of policies, programs, and administrative tools designed to influence the pattern of urban development in the United States. In most nations throughout the world, such a strategy has implied coming to grips with the unchecked growth of giant metropolitan areas and with the problems of organizing growth in the less prosperous or lagging regions. Countries with mature urban growth strategies have recognized the interdependency and the convergence of these problems and have shaped their strategies accordingly.[3]

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[1] *Report on National Growth 1972* (Washington, D.C.: U.S. Government Printing Office), 1972.

[2] See, for example, a recent memorandum (June 9, 1972) prepared by Raymond Waldmann, Staff Assistant to the President, entitled "Scope of Work - National Growth Policy."

[3] See Lloyd Rodwin, *Nations and Cities* (Boston: Houghton-Mifflin), 1970.

The emergence of an urban growth strategy in the United States will undoubtedly focus attention on a number of key land-use questions: (1) the organization of metropolitan growth; (2) the development of lagging regions; (3) the push for ethnic autonomy. In the process, we think there will be increasing emphasis on ways of linking the decentralization of big cities with the development of lagging areas, on the use of new towns to reorganize growth in metropolitan and lagging regions, and on the appropriate roles for State government in implementing growth strategies and confronting ecological issues.

In examining these questions, it will be evident that much of the conventional land-use research dealing with economic base studies, location, and price theory and institutional analyses of land-use controls is not irrelevant. Of even greater interest, however, is the fact that questions which have stumped land-use planners for years can now be asked in new and sometimes more fruitful ways.

In this age of disenchantment with big government, still another move to consolidate power at the Federal level–this time in the form of a national urban growth strategy–will undoubtedly be met with great skepticism. Yet, not since the 1930's have we as a Nation paid serious attention to land-use issues or problems of urban growth.[4] It is not surprising that the inability of State and local governments to come to grips with unchecked metropolitan expansion has produced great frustration and has led, inevitably, to a call for greater Federal involvement. There does not seem to be any other way of dealing with many of these issues. Federal inactivity in this area over the last few decades has created a vacuum that waits to be filled.

This is not to imply that State and local governments will not have a role to play in implementing a national urban growth strategy. On the contrary, within the context of a carefully articulated national settlement strategy, State and local governments may be able to accomplish a great deal. With Federal support, State governments, especially, may be able to play a much more effective role in meeting environmental and land use needs.

To be sure, any division of responsibilities will create fresh problems. This is to be expected. More important, perhaps, points of view will change–just as if we had finally reached the top of the mountain and were able to see the full intellectual landscape for the first time. With further experience, of course, some of these promising perspectives will doubtless prove to be misleading; but surely one of the genuine functions of an evaluative research effort will be to help us to learn these lessons quickly.

Let us turn now to an examination of these new questions.

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[4] It is surprising to see just how little progress we have made since the National Resources Planning Board issued its reports on State and regional planning for national urban growth.

ORGANIZATION OF METROPOLITAN GROWTH

The problem of organizing growth in metropolitan areas has plagued planners for several generations. Electricity and the automobile made it possible for families and firms to leave the inner city and to acquire more space, better housing, schools, and public services, and to escape from a variety of other problems: e.g., congestion, higher taxes, corrupt politics, racial problems, etc. Some of the problems were exaggerated, and some of the presumed lower costs turned out to be illusory. But the trends persisted; worse still, they became increasingly difficult to reverse. This is because individual municipalities have lacked the power to check or to shape the forces of suburbanization. State governments were equally impotent because they relinquished many of their basic "police powers." The home-rule traditions in the States have made it almost impossible for them to regain the upper hand.

Most experts now concede that significant collaborative efforts between communities within a metropolitan region are impossible, given the balkanization of local jurisdictions and of current decisionmaking powers. The best we can hope for, it has been suggested, are ad hoc treaties or negotiated agreements between various local communities; these appear unlikely without the pressure of compelling needs or attractive incentives.[5] Despite these constraints, there has been a fairly substantial body of research tracing and analyzing the emergence of urban systems and settlement patterns within and between metropolitan areas. But if we postulate the existence of a national urban growth strategy, the prospects for using this information to influence the organization of metropolitan areas and urban systems increase substantially. What is more, if the Federal Government decides that the disparities in levels of services and quality of environment between central cities and suburbs must be overcome, and that new housing and employment opportunities must be provided for low- and moderate-income residents throughout the metropolitan region, the big question then would be how the "rules of the game" ought to be changed to make more acceptable metropolitan development strategies possible.

In point of fact, the Federal Government has tried increasingly within the last few years to encourage areawide planning and coordinated development.[6]

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[5] For a summary of the literature dealing with metropolitan government, see Roscoe Martin, "Government Adaptation to Metropolitan Growth," and Charles Adrian, "Public Attitudes and Metropolitan Decision-Making," in *Politics in the Metropolis*, Thomas Dye and Brett Hawkins (eds.) (Columbus: Charles Merrill Publishing Co.), 1967.

[6] David Boyce, Norman Day, and Chris McDonald, *Metropolitan Plan Making* (Philadelphia: Regional Science Research Institute), Monograph Series No. 4, 1970; also Vincent Smith, "The Intergovernmental Cooperation Act of 1968: Opportunity for State Government," in *Planning 1971* (Chicago: American Society of Planning Officials), 1971. Recent areawide efforts in the areas of water quality and transportation planning are summarized in *State Planning Issues 1972*.

But these efforts have been limited largely because of the absence of a national policy on metropolitan development. Once such a policy emerges, however, we can expect increased pressure for more generous incentives for joint efforts by communities within metropolitan regions. These efforts will go beyond the current joint programs in public works, open space, mass transportation, and recreation; they will encompass housing, industrial, and commercial development, and control of pollution and environmental quality, as well as new or expanded communities and agreements for metropolitan collaboration.

In terms of the research implications, it would be important to assess the scale and form of the incentives that will be needed to produce significant effects. Given the likelihood of producing such effects, national and metropolitan land-use planners would betray more than a casual intellectual curiosity about the costs and benefits of different density and settlement patterns.

There would also be new interest in the organization of metropolitan settlement patterns: in whether growth should occur by whole communities or by components of such communities; in whether and when existing communities in outer areas ought to be expanded, or several new communities built, or growth encouraged in one or a very few locations within and outside the metropolitan region. We would expect, in addition, much more exploration of the accessibility requirements for various jobs and services of different types of firms and households, and of the types of settlement patterns likely to prove most flexible and responsive to technological innovations, and least harmful in terms of ecological effects.

THE DEVELOPMENT OF LAGGING REGIONS

To date, Federal efforts to stimulate growth in lagging regions have not worked very well, if at all. Efforts to upgrade the labor force, improve public facilities, and establish transportation linkages to distant markets have achieved very little.[7]

If, however, we are thinking in terms of a national urban growth strategy, the two most important questions would be: (1) Can we select two or three growth centers in which to focus new regional development in an effort to help transform a lagging area? and (2) What assistance can we provide in the form of social investments (such as health, education, transportation, welfare, and information programs) for the population of regions where it is not feasible to promote development?

In many ways, the whole idea of a national urban growth strategy runs counter to traditional Federal grant-in-aid and development policy in this country as well as elsewhere. Political pressures are such that it is difficult (if not impossible) to concentrate resources in a small enough number of places to have a disproportionate impact unless we provide other reasonable forms of assistance for the population in areas where development will not be encouraged. What we need is a principle of selectivity. At any given point in time, public policy ought to be organized to promote growth in some areas, to limit it in others, and to provide appropriate forms of assistance in both areas. In the past, this has not proved feasible. Everyone had to have his piece of the pie. But if we are to have a national urban growth strategy that works, it will be because we finally decide to concentrate growth in selected locations.

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[7] Sar Levitan, *Federal Aid to Depressed Areas* (Baltimore: Johns Hopkins Press), 1964; also various reports prepared by the U.S. Department of Commerce (EDA): *Public Works Program Evaluation* (1970), *Final Report on Federal Activity Affecting Location of Economic Development* (1970), *Evaluation of the Business Loan Program* (1970), and especially an unpublished report entitled "EDA Growth Center Strategy Evaluation" (July 1971).

To make such a strategy work, we would need to know—

- What criteria to use in selecting growth centers and in selecting centers which will export population;
- How best to spur growth in some lagging areas (e.g., what Federal policy should be on facilities location, tax incentives, direct governmental intervention in industrial location); how best to encourage the movement of population from other areas, or their adjustment to a declining economic base;
- What the impact of a growth center program would be on the character of rural life;
- What techniques are available for influencing the range and intensity of the "spread effects" of regional growth; and
- What patterns of urban settlement are most likely to encourage the diffusion of innovative ideas as well as enhance access to jobs and services.

RACE RELATIONS AND ETHNIC AUTONOMY

The racial issue in the United States is different from anywhere in the world. In most other countries, discrimination and prejudice as well as ethnic pride are concealed. Here, however, they are open, raucous issues. Questions of ethnic autonomy have risen to the top of the list of national concerns. They will have to be faced in formulating a national growth strategy. Our prediction is that racial and ethnic considerations will come to dominate land-use planning and the choices that must then be made will be difficult indeed.

For the past generation, civil rights groups have spearheaded efforts to pierce the exclusivity of the suburbs.[8] Racial equality, fair housing, and integration have been their bywords. Today the passion for local autonomy has confused the issue. With political control of several major cities practically

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[8] Oscar Handlin, "The Goals of Integration" in *The Negro American* (Parsons and Clark (eds.)) (Boston: Beacon Press), 1965. For a review of the recent efforts to break down exclusionary zoning in the suburbs, see Jerome Aumente, "Domestic Land Reform," in *City*, Jan.-Feb. 1971, pp. 56-57.

within their grasp, many black leaders are extraordinarily wary of dispersal or integrationist strategies. Anything that threatens to dilute their emerging political majority is subject to careful scrutiny and, more often than not, severe criticism.[9] It is not clear whether one segment or the other of the black community will dominate, or whether an alliance will be forged that can somehow reinforce their separate objectives.[10] Nor is it clear how other groups will react to this situation. Will significant forces be mustered to support the integrationists in the hope of staving off polarization of the black central cities and the white suburbs?

The continued physical separation of the major racial groups has, without a doubt, seriously strained social relationships. Mass demonstrations for equality of treatment, for access to better quality schools, and for equal employment opportunities can be seen as efforts to overcome the barriers that have isolated blacks and other minorities from the rewards of American life.[11] Consider one example:

> In our large metropolitan cities, because of the segregation of housing and the traditional neighborhood concept of school attendance, a disproportionate number of schools, particularly at the elementary level, became predominantly Negro or predominantly white, with the Negro schools being inferior. Opposing theories . . . for dealing with this situation . . . have generated serious community conflicts. There are those who feel that efforts should be concentrated upon improving the quality of education in these depressed areas by larger allocations for plant improvement, remedial work, new curricula, and better trained teachers. Others contend that substantial improvements of slum schools cannot be achieved until such schools lose their predominantly Negro or predominantly white character. . . . While a variety of techniques have been proposed, each has generated rather serious opposition.[12]

Metropolitan land-use planning has not faced these issues in the past. It will not be able to escape them in the future. We believe a concerted three-pronged attack is called for at the national level and that a significant research effort will be necessary to sustain successful policies in all three directions. It will be essential to show how new opportunities can be provided for the relocation of the black population in expanded suburbs and new cities.[13] It will also be important to show how the social, physical, and economic conditions of the central cities can be enhanced, essentially through a reorganization of metropolitan growth patterns, an increase in the income of cities and their residents, and a reduction in the excessive concentrations and high densities in the black ghettos.[14] In addition, new growth centers will have to be developed in lagging regions to serve as alternative living environments for black as well as white migrants.[15]

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[9] For example, see Mel King, "Metro-Folly," a paper prepared for the Boston Development Strategy Research Project, MIT Department of Urban Studies and Planning, Apr. 1972.

[10] The grounds for such a rapprochement are outlined in Harold Sims, "Whitney Young's Open Society," *The Annals*, July 1971, pp. 70-78.

[11] E. Franklin Edwards, "Community and Class Relations," in Parsons and Clark, *op. cit.*, p. 286.

[12] *Ibid.*

[13] One suggestion along these lines was made by Ervin Galanty, "Black New Towns," *Progressive Architecture*, Aug. 1968, pp. 126-131.

SOME CONCRETE RESEARCH PROBLEMS

The Federal establishment has recently decided to support research on national urban growth strategies. Thus, the National Science Foundation, the Department of Housing and Urban Development, the Economic Development Administration as well as a number of private foundations such as Ford and Kettering have allocated funds for more-or-less exploratory studies. But as time goes on, the policymakers as well as the research establishment will probably be asking for precise kinds of analyses dealing with the comparative impact of specific development alternatives and the sociopolitical "costs and benefits" of various-modes of Federal intervention. The emphasis over the next few years will be on how to deal with the obstacles to policy implementation and on how to measure and anticipate the "redistributive" effects of alternative settlement patterns (e.g., how will different regions, different areas within a given region, and different groups within a particular area be affected; how are the power relationships and the spatial distribution of activities likely to be changed?).

Four pragmatic problems–one involving methodology and three involving policy oriented issues–are likely to be of exceptional importance:

- How to develop relatively reliable methods for estimating the impact of urban growth strategies;
- How to link the decentralization of big cities with programs for the promotion of lagging regions;
- How to use the new-town device to reinforce urban growth centers;
- How to tap the powers of State governments to implement urban growth strategies and to cope with emerging ecological issues.

Evaluating Alternative Urban Growth Strategies

In terms of the overall national development alternatives that may be feasible, a major need for the future will be to fashion an effective means of evaluating systematically the social and economic consequences of different strategies for urban and regional development. Judgments, when made at all, are now largely intuitive. Too little is known about the effects of different policies, particularly those affecting investment, incentives, income distribution, and welfare. Ad hoc measures for planning and coordination still waste scarce resources. We often fail to encourage development in regions with significant growth potential, while directing resources to areas where congestion has already sharply diminished returns. The pressure to devise consistent policies which will take account of efficiency, growth, and equity goals will force us to improve our model-making efforts. In particular, we are likely to resort increasingly to computer-based dynamic simulation models, in which major national subregions and important metropolitan areas would be represented by separate submodels.[16] Efforts in this direction are likely, particularly because current models have many limitations. Thus:

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[14] This approach is advocated by John Kain and Martin Persky, "Alternatives to the Guided Ghetto," *The Public Interest*, No. 14, Winter, 1969. Also see John Kain, *Race and Poverty* (Englewood Cliffs: Prentice-Hall), 1968.

[15] This approach is explored in Niles Hanson's two volumes, *Rural Poverty and the Urban Crisis* (Bloomington: Indiana University Press), 1970, and *Intermediate Sized Cities as Growth Centers* (New York: Praeger Publishers), 1971.

> Important aspects of reality, including scale economies, externalities and nonlinearities have been ignored to made models tractable; distortions are introduced through aggregation; only quantifiable variables can be examined, and data are frequently unreliable. Certain formal models alone do not provide a sufficient basis for making policy decisions. Human judgement and intuition must remain important components of actual decision processes for the foreseeable future. Nonetheless . . . much progress is also being made in increasing the reliability and reducing the restrictiveness of large scale models. The speed and relative cheapness of modern high-speed computers enable us to test a wide range of assumptions and policies. In addition, the benefits accruing from a model-building effort go far beyond the immediate utility of the final model itself. Building a model disciplines thought processes. Variables must be defined clearly and unambiguously. Assumptions have to be made explicit. Gaps in existing knowledge are revealed. The need for certain crucial decisions becomes apparent. Sensitivity analysis allows assessment of the relative importance of particular pieces of data and thereby indicates where efforts on data refinement will have the greatest payoff.[17]

Linking the Decentralization of Big Cities With the Development of Lagging Regions

A critical substantial problem for the future is how to help large cities control their development and improve the quality of public services without having to worry about driving out critical revenue producing activities.

For example, it may make sense to explore the ways in which big cities—through full pricing of social costs and other mechanisms—might encourage appropriate firms and households to leave, before congestion and other diseconomies afflict a large part of the population.[18]

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[16] Aaron Fleisher, John Harris, and Lloyd Rodwin, "A Proposal for The Development and Implementation of a Simulation Model for Evaluating Urban Growth Strategies," United Nations, Center for Housing, Building, and Planning, Jan. 1972.

[17] *Ibid.*

[18] For a discussion of economies and diseconomies of scale, see William Alonso, "The Economics of Urban Size," *Papers of the Regional Science Association*, vol. XXVI, 1970, and Harry Richardson, "Optimality in City Size, Systems of Cities and Urban Policy: A Skeptic's View," *Urban Studies*, Feb. 1972.

To encourage movement out of overburdened metropolitan areas and into some lagging regions where the potential for long-term growth may well be very real, we will need more than the customary incentives and disincentives. Lagging regions are all too unappealing, and successful metropolitan areas (because of the problems they face in trying to finance public services) are all too likely to fight the loss either of wealthy residents or of revenue-generating activities. The voluntary decentralization of firms and families that does occur provides little if any hope for the regions that desperately need assistance. Somehow a more powerful system of incentives and controls will have to be devised to compensate those metropolitan regions willing to cooperate with preselected growth centers in lagging regions.

The British have had some experience in linking the decentralization of London, Manchester, and Lancashire with the development of new towns and expanded towns. Their experience might provide some clues. Further experiments along these lines will be necessary in the United States before we can make such a program work on a large scale. Undoubtedly, many inner cities, which consider themselves to be "lagging areas" requiring priority assistance, will oppose such experiments. This opposition may be lessened if they come to accept the reduction of inner-city densities as an important step toward the effective reuse and development of core-city areas.

If we develop a method of collecting and allocating tax revenues at the national level, we might deal more effectively with imbalances in urban growth and economic development. Such a tax system would have to be responsive to different levels of need and fiscal capacity, on the one hand, and yet protective of the fiscal integrity of State and local governments, on the other. To devise such a system we will have to finance a larger proportion of the costs of municipal services with sources of revenue other than the property tax. Clearly, if every municipality received an allotment of funds from a Federal kitty to defray a significant portion of these costs, the cutthroat competition for new industry would be vastly moderated, if not eliminated. Just as it might be interesting to explore what settlement patterns might result if full social costs had to be paid by all firms, so might it be revealing to see what settlement patterns would result from the removal of all locational costs, such as property taxes and possibly even user charges.

Still another basic question is: Why must city governments be crippled because commercial and industrial entrepreneurs find it more efficient to locate in the suburbs? Would it be possible to separate the design and management of public service systems from administrative decisions about the creation and operation of mechanisms for collecting taxes? Undoubtedly there would be very difficult problems involved in adopting such a radically different approach to municipal finance. How would we insure minimum levels of service in poor areas? How would we insure wealthier communities a higher level of services, if they so desired? And the most important concern, if course, would be how to insure State and local governments their independence.

New Towns and National Urban Growth Strategies[19]

Federal support for individual new communities ought to depend on the role that they play in a national urban growth strategy. Up until now, however, this has not been the case.[20] Instead, the Federal new towns program has been used primarily to "bail out" private developers involved in large-scale community building efforts.

New communities have not been designed to help reduce congestion or slow down growth in our biggest cities or to reorganize development patterns in metropolitan areas. Nor have publicly–or privately–supported new communities helped to spur social and economic development in lagging regions, especially in areas with large unemployed and underemployed populations. This situation is not likely to change as long as undue emphasis is placed on maximizing short-term financial returns on every project.

If we expect to convince large groups of people to move from the inner city to new communities, provisions will have to be made for neighborhood government and local control over key public services. Also, by providing capital investment opportunities as well as guaranteed markets for goods and services, new communities could become attractive territory for minority-run enterprises. Thus, Federal contracts and purchasing agreements might be used to insure the growth of minority-controlled businesses in new communities. In the long run this should help to generate additional revenues that could be reinvested in the inner city.

We need to know more about the advantages and disadvantages of building at a new community scale, particularly:

- Criteria that might be used to evaluate proposed new-town development efforts;
- The kinds of staging strategies most likely to yield diversified and balanced communities;
- The second- and third-order effects of new-town development on the surrounding region; and
- The questionable land-use assumptions typically buried in new-town plans (e.g., rules of thumb that suggest how much land ought to be put aside for recreation and other purposes).

We question whether the present financial "guarantees" are sufficient to insure the kinds of new communities that we want. Moreover, we think it highly unlikely that these problems will be overcome until there are clearer guidelines as to how and when the Federal Government might intervene in the community development process, and give more support for public development corporations in their efforts to build new towns.

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[19] Further elaboration of many of the ideas contained in this section can be found in Lloyd Rodwin and Lawrence Susskind, "New Communities and Urban Growth Strategies," a paper presented at the American Institute of Architects' Conference on New Communities, Washington, D.C., 1971.

[20] Lawrence Susskind and Gary Hack, "New Communities in a National Urban Growth Strategy," *Technology Review*, Feb. 1972.

The Role of State Government in Managing Urban Growth Strategies and Confronting Ecological Problems

In an effort to maintain environmental quality and to insure balanced development, a growing number of State agencies are likely to step up their involvement in land-use planning.[21] For example, the President's Commission on Urban Problems (The Douglas Commission) has already suggested that State governments ought to enact legislation denying land-use regulatory powers to local governments that fail to adopt development guidance programs.[22] States were urged to see that land-use controls mesh with locally approved development policies covering such matters as transportation, housing, open space, air and water pollution. Better local capital improvements programing was also recommended, as well as the development of a core of trained professionals on a continuing basis to assist in the formulation and administration of local regulations.[23] The Douglas Commission also argued for planning and development agencies, responsible directly to the Governor, to prepare State and regional land-use plans and to adjudicate State and local decisions affecting land use.[24] It also proposed State legislation enabling public authorities to acquire land in advance of development in order to assure the continuing availability of sites needed for development, control the timing, location, type and scale of development, prevent urban sprawl, and guarantee that gains in land values resulting from governmental actions accrue to the public.[25]

Several States (i.e., Hawaii, Vermont, Maine, and Florida) have already adopted many of these suggestions.[26] One reason is the increasing outrage over air and water pollution and widespread resistance to disruptive highway construction. Another is an aggressive and environmentally sensitive public, increasingly aware of the fact that local communities have very little control over the forces of urbanization. The State now appears to be the only governmental unit in a position to balance environmental concerns with local pressures for community and economic development. Indeed, if one of the national land-use bills presently before this session of Congress should pass,[27] the Federal Government would require each State to develop and implement an overall land-use plan. One hundred million dollars or more would be appropriated for the making of such comprehensive plans. Each State would be required to designate critical environmental areas, such as rivers, swamps, and beaches; areas for key facilities, such as highways, airports, and parks; and areas for large-scale development, such as industrial parks and new towns. The latter, in particular, offer a special opportunity to plan simultaneously for areas of open space, community facilities, and employment.

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[21] For a more detailed discussion of State land-use planning efforts in Hawaii, New York, Maine, and Florida, see Kathleen Ageena, "The Implications of Nixon's Non-Policy Toward Urban Growth," *Newsletter of the American Society of Planning Officials*, vol. 38, No. 5, June 1972, and *State Planning Issues, 1972 and 1972.*

[22] *Building the American City*, The Report of the National Commission on Urban Problems to the Congress and the President of the United States (Washington, D.C.: U.S. Government Printing Office), 1968, p. 237.

[23] *Ibid.*, p. 238.

[24] *Ibid.*, p. 239.

[25] *Ibid.*, p. 246.

[26] These explanations were first presented by Kevin Lynch et al., "Improving Commonwealth Policies for Accommodating Increased Urban Development," MIT Department of Urban Studies and Planning, July 1970.

If these powers are provided, States would be less likely to ignore the ecological effects of rural-to-suburban shifts in land use. Open space, currently gobbled up by subdivisions, would have to be protected. Air and water pollution caused by the construction of airports and vast conglomerations of light industry would have to be controlled. The development of flood plains and steep slopes would have to be checked and construction over areas where groundwaters are normally replenished would finally be prohibited.[28]

In exercising leadership, each State would have to decide just how aggressive it ought to be in redirecting the development policies of public agencies and private institutions and in enforcing environmental protection regulations. A State urban growth strategy could insure that local governments have a benchmark against which to chart the success of their own development efforts.[29] Federal programs might be integrated with the work of many State development agencies. If this should happen, planners and policymakers in State government will have to come to grips with the issues mentioned earlier: the creation of more effective tools and methodologies for analyzing alternative development strategies, the linkage of rapidly expanding metropolitan areas with lagging regions, and the very sensitive issues of racial balance and ethnic autonomy. Improvement of the administrative and research capabilities of State governments would then require top priority, for the effectiveness of any national growth strategy may ultimately depend on the degree to which the States are able to shoulder their share of the land-use planning burden.

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[27] These bills include (1) the Land and Water Resources Planning Act (proposed by Senator Henry Jackson, D-Wash.); (2) the National Land Use Policy Act, H.R. 2449 (proposed by Rep. Wayne Aspinall, D-Colo.); and (3) the National Land Use Policy Act, H.R. 4332 and S. 992 (the administration's bill). See Kathleen Ageena, *op. cit.*, for a more detailed analysis of these bills.

[28] These and other ecological considerations are spelled out in the *First Annual Report of the Council on Environmental Quality* (Washington, D.C.: U.S. Government Printing Office), 1970, ch. IX, and Joseph Shomon, *Open Land for Urban America* (Baltimore: The Johns Hopkins Press), 1971.

[29] Lawrence Susskind, "Guidelines for State Involvement in the Development of New Communities in Massachusetts: Towards a State Urban Growth Policy" in *Papers on National Land Use Policy*, prepared by the Committee on Interior and Insular Affairs, U.S. Congress, Washington, D.C., 1971.

CONCLUSIONS AND INFERENCES

The tools available to the planner in the context of a national urban growth strategy will be more powerful than those available at the present time. A radical restructuring of the tax system may eliminate artificial constraints on the location of households and firms—thereby opening up the possibility of achieving more functional alinements of land uses. Federal coupling of growth centers and new towns in lagging regions may allow us to overcome some of the economic deficiencies that have not responded to development incentives in the past. And, as States take on a new and more important role in confronting ecological issues, land-use planners may find new allies willing to help enforce strict environmental controls.

Once the rules of the game are changed, however, the results of governmental intervention may become even more uncertain. Even if the executive and congressional branches of the Government decide to use the considerable powers at their disposal, like the Gods on Mount Olympus, they would have to decide whose interests to champion and how to intercede most effectively. By changing the policy arena, we often take for granted that new and effective coalitions will form and that the balance of power will shift in desirable directions. Sometimes this happens. For instance, it has been easier to implement certain programs for the poor and the disadvantaged by taking action at the national level. Examples are improvements in social security, minimum wage, public welfare, and equal rights. But we must not forget that there are discouraging examples as well. Until recently the Federal Housing Administration did very little to provide housing for the poor. Moreover, in some cases it has been easier to block action once power has been shifted to the highest level.

There will also be serious problems for the States in trying to decide where urban growth should occur. Even after detailed plans have been drawn up, some State officials may find it hard to stand by them. The tendency will be to expend great amounts of time and money collecting information (designing elaborate land-use information systems), drawing land-use maps, monitoring environmental quality, and generating long-term growth projections. But if strong local opposition emerges to particular regulations, State officials may cave in. Justice Holmes was right: general propositions rarely decide concrete cases. When political pressures build, State officials may be too insecure to hold their ground.

Partly because of these pressures, we believe strong support for a national urban growth strategy may come from State and Federal program administrators. They need a coordinated set of national policies to justify their day-to-day decisions. Transportation officials, for example, are being pulled in one direction by highway lobbyists and in the other by various inner-city groups demanding improvements in mass transit. Public policy choices can be rationalized by appealing to a meaningful or persuasive set of principles or at the very least a set of official pronouncements that State and Federal officials can use to get themselves off the hook. In trying to maintain national environmental standards (even in the face of industrialists threatening to pull up stakes) State officials will appeal to the Federal Government for help. Federal agency heads will press Congress and the President for an overall growth strategy to help justify tough regulations. In the end, "institutional insecurity" may account, more than anything else, for the emergence of a national urban growth strategy over the next few years.

Finally, because the Government is veering in the direction of an urban growth strategy, we ought not to assume it will provide benevolent and enlightened leadership that will sustain the program through periods of difficulty that might lie ahead. On the contrary, there is much disconcerting evidence to show that even in the short run, changes in Government policy and administration can cause perilous lurches and lags in patterns of development. Changes in leadership, values, and purposes can, as Charles Abrams often reminded us, convert measures of reform into instruments of repression. Without unremitting vigilance, the emerging national urban growth strategy is hardly likely to be the exception.

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Chapter 6

CONFLICTS IN LAND USE

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This paper deals with conflicts in the use of land. Land-use law, even more than other fields of law, has developed through judicial and legislative resolution of the conflicting positions of various interest groups, with only a minimum of detached scholarly assistance. Land-use law has long lacked a sizable corps of academic specialists who could view it with detachment. In law schools the field is only now beginning to be recognized as a cognate specialty, independent of the conveyancing interests of the teachers of property law and the vote-counting proclivities of the teachers of local government law.

By the nature of their work, most lawyers tend to see the world as a series of conflicts that they are asked to resolve. Frequently these conflicts are between two or more desirable goals and the legal system is forced to make some difficult choices.

The authors have had the benefit of viewing these conflicts from a variety of perspectives. There are few interest groups, public or private, whose cause we have not advocated in some city hall, courtroom, or legislative chamber. Various consulting roles with governmental agencies at the Federal, State, regional, and local levels have given us a feeling for the intergovernmental aspects of land-use problems and we have attacked local restrictions for indignant developers and defended local regulations against hungry builders. We believe we approach land-use issues without any predetermined bias in favor of any single interest group, but this does not mean that we do not hold strong opinions of our own (occasionally at 180° poles from one another).

This paper is divided into two parts. The first part discusses conflicts that lawyers deal with on a day-to-day basis—immediate issues that are clearly perceived in the form of the arguments on each side, but on which there has been remarkably little objective research. The second part tries to visualize the legal issues that, in coming decades, will be created by the new relationship of man to land. We hope that exploration of these nascent issues can forestall or brake future conflicts.

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CONFLICTS AT ISSUE TODAY

Most debates over public policy on land use in this country involve relationships between three parties: (1) the owner of the land; (2) the local government directly concerned over the development of the land; (3) those interests (not represented either by landowner or the local government) which may be affected by decisions made by either of the first two parties. As in other affairs, this *menage a trois* can and frequently does result in injury to one of the parties.

As practitioners in the art of land-use counseling, where resolution of conflicts between two or more parties has been characterized more by blind bashing than by careful analysis based upon known facts, we make preliminary suggestions as to where research is needed in order to find useful legal solutions to these conflicts.

We deal first with the more traditional confrontations, that between landowner and local government.

The Intramural Contest: Landowner and Community

We have more than half a century of experience with municipal regulation of the use of private property through zoning, subdivision, and related controls. For those of us who have spent time in this process, each year we feel less confident that we know *why* we are doing what we do. We do know that our efforts to adopt old tools to current needs too often result in inequities either to the landowner or to the other citizens of the local community. Yet in suggesting new techniques we are only dimly aware of the legal justification for what we propose, or the social or economic consequences.

Proposals for legislation should be reinforced by research and analysis in these areas:

THE RELATIONSHIP BETWEEN PUBLIC EXPENDITURES AND PRIVATE DEVELOPMENT

Two illustrations come to mind. First, many municipalities are extracting contributions in land or money as a condition of a grant of development permission. State legislatures and courts are increasingly sympathetic to this practice. The old rubric that the private developer must pay only for the initial capital costs of public services directly related to his development (e.g., internal streets and sewers) is being replaced by a policy that insists he contribute land for parks or schools which benefit the general population. He may also be asked to put in cash that helps the entire municipal fisc. This policy is understandable in light of the financial pains that have wracked suburban communities this last decade, but to understand the motive is not to agree that it is fair socially or sound economically. Is it, as some critics allege, a "double tax" on the buyers or renters? Is this cost passed on or absorbed? Is there an outer limit which this practice should be interdicted? Is there a rational basis for any rule of law that could have general application?[1]

A second illustration of this difficult relationship between private developer and public expenditures arises out of the public expenditures which are of significant benefit to private landowners. This is nothing new; it has been with us at least since the Federal Government started to build post roads and it reached its apogee with the interstate highway program that conferred enormous benefits upon lucky investors. There will be a substantial public expenditure in many larger cities in the 1970's that will provide an opportunity to determine how to distribute these special benefits more fairly.

We refer to the impact of proposals for mass transit systems on land values. Transit stops will generate enormous changes in land values, which in turn may generate development requiring more public expenditures. A host of questions are unanswered. Do we know or can we predict the area of impact of a particular type of mass transit facility? Do we know what type of development should be encouraged? Discouraged? What legal techniques are needed that are not now available? Is there any valid way to redistribute benefits that would otherwise accrue to a limited number of landowners? Or impose on them some of the added costs their development would impose on others? As we said, these issues are not new. Mass transit simply presents an opportunity for a system of regulation that has been notably absent in the past history of public improvements.

THE LEGALIZATION OF URBAN DESIGN

We are witnessing a growing passion for an even greater role in the design of our metropolitan environment. These demands are not silenced by jaundiced references to the wedding-cake Manhattan skyline caused by public regulation (through zoning). Nor are they mollified by the sterile design of public housing in the thirties and forties or hilarious descriptions of the nonsensical suburban efforts intended to regulate design through "look-alike" and "no-look-alike" architectural ordinances.

Yet the courts are becoming more sympathetic to a public place in this sensitive judgment.[2] In a democracy is the legalization of design good policy? Can it be consistent with our notions of fair play and produce a result that is better than the best of a private decisionmaker and no worse than his worst? Is the term "standards" (so essential to due process) totally incompatible with the ineffable nature of good design? Or does our increasing knowledge of environmental design allow us to work out esthetic standards based on scientific principles? And, finally, is European experience transferable to our political and legal system?

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[1] See J. D. Johnston, Jr., "Constitutionality of Subdivision Control Exactions: *The Quest For a Rational*," 53 Corn. L.Q. 871(1967); M. E. Brooks, "Mandatory Dedication of Land or Fees-in-Lieu of Land for Parks and Schools," ASPO Planning Advisory Service Report No. 266, Feb. 1971.

[2] See H. B. Steinberg (ed.), "Aesthetics vs. Free Enterprise – A Symposium," 15 Prac. Lawyer 17 (1969).

THE DISCRETIONARY PROCESS AND LOCAL LAND-USE ADMINISTRATION

Zoning, as originally conceived by Bassett, allowed its administrators little more discretion than that necessary to measure the depth of the required front yard. This "Euclidean" zoning, in which all the rules were rigidly set forth by legislative enactment, was increasingly criticized as encouraging sterile design. As the Pennsylvania Supreme Court put it: "This general approach to zoning fares reasonably well . . . so long as no one cares that the overall appearance of the municipality resembles the design achieved by using a cooky cutter on a sheet of dough."[3]

These esthetic objections to Euclidean zoning were reinforced by an even more powerful force: the Euclidean rules cost the builders more money. Planners and builders believed they could design better residential developments at less cost if given more flexibility. As a result they supported the Planned Unit Development (PUD) concept, which was embraced by hundreds of communities. The "PUD" has been hailed as the answer to the sins and the problems of land developers of previous generations.

Now that the PUD technique has been applied, it is no longer universally hailed as a breakthrough, either by the private market or by the existing residents of local communities. It is now time to examine this PUD technique before it becomes, like many other zoning concepts, an amulet whose power can no longer be challenged.

Investigation should focus broadly on three areas:

- Is the PUD effective in improving the form of land development? Does it really provide an esthetically superior environment? Is life in a PUD more satisfying? Does it provide the promised economic benefits? Are we merely substituting cooky-cutter apartments for cooky-cutter houses?
- The PUD system encourages a focus on overall density rather than on design standards for each lot. But there is no issue that engenders a more emotional debate than the question of density. What is bad, and for whom, about high density? Slums are characterized by high densities, but so is Park Avenue and Lake Shore Drive. Can rational criteria be established for making a judgment about proper densities?
- The typical PUD stretches the limits of administrative discretion near the breaking point. Is it consistent with the rule of law to make a million dollar decision depend on local officials' determination of

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[3] *Cheney* v. *Village 2 at New Hope, Inc.*, 241 A. 2d 81, 82 (Pa. 1968).

whether a project is "consistent with sound planning"? Can flexibility be encouraged without inviting massive corruption?

THE RADICAL DOCTRINE OF NO NEED-NO RIGHT

The pervasive and unchanging characteristic of zoning is the principle that what already exists is the basis for what shall be permitted to exist. If one high-rise apartment is permitted in a neighborhood that was formerly single family in character, the second high rise cannot be far behind. And so with the first corner gas station or, indeed, the first 236 housing project. The rehabilitation of the Lincoln Park area on Chicago's near North Side in the early 1960's made it a remarkable oasis of two- and three-story brownstones for family living. With the dramatic rise in land values came pressures for more intense development designed not so much for families as for singles or childless couples; one more excuse to take the kids and flee the city. If some mix of densities, housing types, and commercial uses may be economically and socially beneficial, we have yet to devise a system of land-use regulation (and compensation?) that permits the public decisionmaker to say "so much and no more."[4]

What may be needed is not only a legal rationale similar to that employed in the licensing of taverns and taxicabs (which starts with the reverse premise to zoning), but the polishing of techniques for permitting the partial taking of development rights and their resale. New techniques may also be needed for authorizing would-be developers to acquire easements from other landowners without triggering an unseemly host of similar proposals.

It is probable that the legal issues may be less complex than the economic implications. What, for example, should Standard Oil pay the owners of three other corners of an intersection to prevent them from erecting gas stations? What should the public or a private developer pay the owners of all other parcels on the block (after one high rise has gone up) to limit their development rights? And if the municipality takes development rights above a specific height or density, is it for a "public purpose" if the Government funds such a program by reselling and transferring those rights to the owners of other parcels in the city?

The Intergovernmental Contest: The Community and Outsiders

It is a comparatively recent idea that a municipality, the long-anointed agent of the State's constitutional police power, has any obligation to persons who are not residing inside its boundaries. The scheme of land-use regulation that delegated powerful leverage to municipalities has been with us so long (since

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[4] See R. F. Babcock, *The Zoning Game*, pp. 73-79 (1966).

1925) that we tend to forget there is nothing in our constitutional system that mandates this scheme.

Today, numerous voices are challenging this way of regulating land use, and the fact that these challengers–homebuilders, ACLU, NAACP, NAM, name your bizarre bedmates–have a motley mix of motives ranging from the most commercial to the most civil libertarian, may increase rather than lessen their ultimate influence.

These challenges to municipal dominance are roughly a case of the "haves" versus the "have-nots," commercial and social; the "ins" versus the "outs." Such questions have surfaced mostly over matters involving subsidized housing and issues customarily identified by the ambiguous phrase "environmental quality." In courts and legislatures the proposition is being advanced, with and without moderation, that the municipality can no longer be accepted as the final decisionmaker in land-use policy, and that challenges to municipal policy can no longer be left to the impulses of private developers.

As with so many revolutions, quiet or otherwise, there is a risk that zealous prosecution of a course of action may not improve the public condition. So we suggest that all parties in the land-use business would be served by some study.

The following specific aspects of this confrontation recommend themselves as useful subjects of further research:

THE "FAIR SHARE" APPROACH TO SUBSIDIZED HOUSING: IS IT USABLE?

The suburbs should be willing to accept a greater share of subsidized housing than they have in the past. Action groups are increasingly concerned over the mounting dislocation between job opportunities and housing. In some urban areas regional agencies have responded positively by proposing to distribute the alleged burden of low- and moderate-income housing among all the constituent communities.

Three illustrations of such a response have received varying degrees of national attention: Miami Valley Region (Dayton, Ohio); San Bernardino, Calif.; Washington (D.C.) Regional Area.

All of these "fair share" proposals have in common (*a*) a recognition that the suburbs have a duty to accept some proportion of the regional needs for low-cost housing; (*b*) a belief that only by a regional approach can disparities in burdens be minimized; (*c*) that a quota system among designated submetropolitan areas, based upon a variety of standards, is necessary to make the scheme work.

Each of these plans places a different emphasis on different criteria. The criteria for allocating the shares among the subdivisions include the number of substandard shelters, job opportunities, school pressures, assessed valuations, availability of mass transportation, and vacancy rates.

Each of these pioneering agencies is careful to emphasize that it does not regard its selection of criteria, or the weight given to them, to be the result of unimpeachable analysis. They acknowledge that what was important was that they were able to obtain a consensus among their constituents that the chosen criteria did represent a rough justice. Clearly, no single local agency has the resources capable of undertaking the kind of research necessary to do a definitive job. It is equally apparent that a particular combination of criteria for one area may not be appropriate for another.

We suggest that a major contribution could be made to other metropolitan areas who may follow the lead of these three regions by undertaking some empirical research of costs and benefits that would provide an equitable basis for open housing in the suburbs.

WHEN DO COMMUNITY POLICIES THROW TOO GREAT A BURDEN ON THE REGION?

On February 24, 1970, the Pennsylvania Supreme Court issued its opinion *In re: Appeal of Kit-Mar Builders.*[5] In that opinion, Justice Roberts stated: "It is not for any given township to say who may or may not live within its confines, while disregarding the interests of the entire area."

Most communities, given their choice, prefer to enjoy the maximum benefits provided by a metropolitan community and assume a minimum of burdens. This, understandably, has been a feature of municipal policy in the last three decades. The increasing criticism of such a parochial policy has led to the attempt to balance local against regional interests. Tentative Draft No. 3 of the American Law Institute Model Land Development Code tries to deal with this balancing process. In selected matters of land use, where regional costs may be involved, a State agency is required to pass upon a proposal for development. It is charged with weighing probable benefits to the region against probable detriments to the local community. Section 7-502 of Tentative Draft No. 3 goes on to provide–

> In reaching its decision the Agency shall not restrict its consideration to benefit and detriment within the local jurisdiction, but shall consider all relevant and material evidence offered to show the impact of the development on surrounding areas. Detriments or benefits shall not be denied consideration on the ground that they are indirect, intangible or not readily quantifiable. In evaluating detriments and benefits under S 7-501 the Agency may consider, with other relevant factors, whether or not
>
> (1) development at the proposed location is or is not essential or especially appropriate in view of the available alternatives within or without the jurisdiction;
>
> (2) development in the manner proposed will have a favorable or unfavorable impact on the environment in comparison to alternative methods;
>
> (3) the development will favorably or adversely affect other persons or property and, if so, whether because of circumstances peculiar to the location the effect is likely to be greater than is ordinarily associated with the development of the type proposed;
>
> (4) if development of the type proposed imposes immediate cost burdens on the local government, whether the amount of development of that type which has

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[5] *In re: Appeal of Kit-Mar Builders*, 268 A. 2d 765 (1970).

> taken place in the territory of the local government is more or less than an equitable share of the development of that type needed in the general area or region;
>
> (5) the development will favorably or adversely affect the ability of people to find adequate housing reasonably accessible to their place of employment;
>
> (6) the development will favorably or adversely affect the provision of municipal services and the burden of taxpayers in making provision therefore;
>
> (7) the development will efficiently use or unduly burden public or public-aided transportation or other facilities which have been developed or are to be developed within the next [5] years;
>
> (8) the development will further, or will adversely affect, the objectives of development built or aided by governmental agencies within the past [5] years or to be developed in the next [5] years;
>
> (9) the development will aid or interfere with the ability of the local government to achieve the objectives set forth in any Land Development Plan and current short-term program; and
>
> (10) the development is in furtherance of or contradictory to objectives and policies set forth in a State Land Development Plan for the area.

Even if the adversary parties make thorough efforts, the agency, in undertaking such a regional program would discover that it is embarked on a venture for which the signposts are few and far between. Certainly there is little in the jurisprudence of zoning, as it has developed, that provides any guidance. Zoning law and zoning litigation has been inward-looking, rarely, if ever, considering consequences beyond the immediate neighborhood of the subject property.

We believe a major contribution could be made to those States which chose to adopt legislation similar to section 7-502 of the Tentative Draft No. 3 by research and analyses that would provide guidelines for the balancing mandated by that section.

THE IMPLICATIONS OF CONCERN FOR THE ENVIRONMENT ON THE HOUSING SUPPLY: WHAT POLICIES AND BY WHOM ADMINISTERED

Last fall the following proposal to amend the charter of the city of Boulder, Colo., was barely defeated at a referendum:

> The City Administration and Council shall adopt regulations and policies to stabilize the ultimate population of the City of Boulder near one hundred thousand.

Instead the voters approved a watered-down version:

> Be it resolved, That the City Government is directed immediately to undertake a definitive analysis of the optimum population and growth rate for the Boulder Valley. Pending the completion of this analysis and approval of programs developed to implement its results, the City Government, working with the County Government, shall take all steps necessary to hold the rate of growth in the Boulder Valley to a level substantially below that experienced in the 1960's and shall insure that the growth that does take place shall provide living qualities in keeping with the policies found in the Boulder Valley Comprehensive Plan.

Both proposals reflected a conviction that Boulder, if it were to preserve those features of its life style it so relishes, had to adopt some governmental regulations that would slow down if not stop growth. And this would be done by "going it alone" and, without a "by-your-leave" to other municipalities, the county, or the State of Colorado.

A different approach to the hazards of growth was undertaken by the town of Ramapo in Westchester County, N.Y. It amended its zoning ordinance to require a special permit for any development other than *one* single-family house by the owner of the land. A permit for development would be issued only if public services and facilities were available. The amendments to the ordinance were based upon a comprehensive plan and were closely tied to a 6-year capital budget and a capital program that provided for additional capital improvements for 12 years after the life of the capital budget. It was conceivable that a landowner might not qualify for a development permit for 18 years even if the town kept to its schedule. It is not surprising that the ordinance was challenged. It may be more surprising that a majority of Court of Appeals of the State of New York upheld the ordinance.[6]

The majority opinion stated:

> The proposed amendments have the effect of restricting development for onwards to 18 years in certain areas. Whether the subject parcels will be so restricted for the full term is not clear, for it is equally probable that the proposed facilities will be brought into these areas well before that time. Assuming, however, that the restrictions will remain outstanding for the life of the program, they still fall short of a confiscation within the meaning of the constitution.

Boulder, Colo., and Ramapo, N.Y., each in its own way, is trying radically to slow down growth. One is tempted to suggest that the local community is the worst of all possible levels of government at which such a policy should be implemented. The dangers in a Ramapo-type solution are manifest, not the least of which is that it will probably slow down planning and implementation at the regional or State level. The Boulder approach may appear to be silly at first glance, but it carries the seed of a vicious race to the ballot box by all communities wishing to shove off growth onto someone else.

Both the opinion of the New York Court and the sentiments behind the Boulder propositions are, of course, placed by their authors in a respectable if not laudable context: to protect the environment. And this leads to the ultimate questions: Which class or classes in society bear the greatest costs of the current environmental surge? Is it possible to provide all the low-cost housing that is needed and still achieve ecological goals?[7] Remember that this is not just a question of land planning but of manufacturing the components of housing at the lowest feasible cost, and providing adequate supplies of fuel for heating and air conditioning. In short, if "no-growth" and ecology are essentially white middle class, is that class bearing its fair share of the costs of implementing those policies? Or is this another case of "Bosun, pull the ladder up; I'm aboard."

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[6] *Golden et al.* v *Planning Board of Town of Ramapo*, N.Y. Court of Appeals, Dockets Nos. 475, 476. Uncorrected opinion of May 3, 1972.

[7] In fairness to the town of Ramapo, it should be noted that the court found that Ramapo had made provision for low and moderate income housing "on a large scale."

It seems to us that there is an immediate need for the kind of analysis and research that will, first, provide answers to these and related questions and, second, will suggest the legal tools to implement an equitable growth policy. Certainly today it is *sauve qui peut.*

CONFLICTS YET UNBORN

Land-use law is society's technique for preventing or resolving conflicts between various ways of using land. As the future brings new ways of using land it will bring new conflicts, which in turn will require changes in our system of land use law.

In the past such changes have, all too often, taken place without conscious forethought. After a new way of using land is developed, the legal rules that seem most analogous are stretched, squeezed, or bent to adapt to the changed conditions. But if we examine, well in advance, prospective changes in our ways of using land, it will often be possible to custom-tailor new legal institutions to society's real needs.

This paper discusses three possible changes in our future ways of using land and examines the impact of these changes on the legal system. Neither the desirability nor the inevitability of these changes is at issue here. All have been widely discussed as possibilities and the likelihood of their occurrence is at least sufficient to justify examination of the consequences for the legal system.

Control of Migration

Since the Articles of Confederation, our Government has been based on the proposition that "We are all citizens of the United States; and, as members of the same community, must have the right to pass and repass through every part of it without interruption, as freely as in our own States."[8] The right of each part of the country to compete for industries, offices, dams, and airbases is a deeply ingrained element of our political system.

Conversely, our system recognizes that no part of the country has any direct power to prevent other citizens of the United States from immigrating. Attempts by the States to limit the migration of welfare recipients have been thrown out by the courts repeatedly.

The United States is not atypical in its experience. The English have failed to stop southeast migration from Glasgow to London. As the Meyersons have pointed out, "no country, even the authoritarian Soviet Union, has successfully limited the size of population-magnet cities."[9] The shantytowns outside Brasilia bear witness to the failure of present systems.

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[8] *Passenger Cases,* 7 How. (48 U.S.) 283, 492.

Our increasing awareness of the interrelated elements of our environment is leading many to conclude, however, that the carrying capacity of the ecosystems of many areas of the country have already been exceeded. It is conceivable that our constitutional traditions must give way to an environmental crisis. At least Dr. Commoner suggests that "whatever stands in the way of the necessary accommodation to the ecological imperative . . . will need to abdicate its immunity from change."[10]

Assuming that new legal rules to control migration are demanded, how will they develop? If they develop incrementally they will probably take the form of controls over the use of land analogous to those by which we now limit portions of metropolitan areas to members of upper income groups. By direct or indirect means, whole regions of the country might be reserved for the upper classes, with necessary low-paid workers bused in and out like South African gold miners.

But if we were to devise a different system of controlling migration (assuming for purposes of argument that it *must* be controlled), how would we do it? To allow local areas to choose their own methods of limiting migration would inevitably favor existing residents. Thus a national system of regulation seems inevitable. But with what criteria?

Let us assume that the National Government concludes that south Florida can support only its present level of population rather than the doubling of it that is currently predicted. How do we choose who gets to live in Miami? Only those over 65? Do we choose a cross section of ethnic groups? Do we try to match talents to jobs? Is it first-in-last-out?

This exercise in devising a legal system for controlling migration is not pure whimsy. If, as we suspect, it results in demonstrating that all of the potential methods of controlling migration portend horrendous social consequences, it will demonstrate that any "ecological imperative" which requires this type of control had better be pretty damned imperative!

The Law of the Megastructure

A more appealing alternative to the crisis foreseen for overcrowded urban areas is the creation of new systems of urban living at high densities that minimize environmental problems. Various proposals for such systems have been put forth in recent years; cities domed or subterranean, floating or sunken, are all lumped in the category "megastructures" for purposes of this discussion.

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[9] Martin and Margy Meyerson, "Some Questions About Enhancing the Quality of the Urban Environment," in *The Future of the United States Government*, H. Perloff (ed.), pp. 327, 333 (1971).

[10] Barry Commoner, *The Closing Circle*, p. 281 (1971).

All megastructures have a common emphasis on a three-dimensional element. Activities would be pursued on a multitude of vertical levels. This requires a number of changes in basic legal theories.

Traditionally the common law visualized land for commodity purposes as the surface of the earth, the ground beneath down to the center of the earth and the air above to infinity. The man who owned the surface owned all that was above and below.

Technological developments have brought changes in this concept, but they have come about incrementally, through the creation of exceptions to the traditional rules. For the most part these exceptions have proven to be an unsatisfactory method of dealing with the problem. For example, the respective rights of airplanes and landowners near airports are still in a state of considerable confusion.

With the coming of the megastructure the idea of relating an individual's "ownership" interest to a specific portion of the earth's surface becomes completely absurd. If we assume that the idea of property ownership is worth preserving, how can we find new methods for identifying the property being owned and specifying the rights and responsibilities of ownership? Can the occupant of cubicle 362 on level 26 of complex alpha be given the same incentive toward assuming a responsibility for the maintenance of his dwelling that present homeowners apparently receive from the concept of homeownership?[11] Can the law governing a condominium be expanded to encompass a whole city?

The megastructure should also force a reexamination of the law governing the control of communal functions: streets, parks, utilities, etc. The use of analogies to existing systems is not a sensible way to determine whether passageway B on level 15 is a "street" that must be swept by the municipal government or a "private" corridor to be maintained by a private individual or by some minigovernment. Does the electric company have the legal obligation and right to deliver power to each dwelling or just to the megastructure "gate"? Only a new approach to traditional ideas of law can resolve such issues sensibly.

The importance of taking a fresh look at these issues is accentuated by our increasing knowledge of the ramifications of environmental psychology. As we understand more of the different psychological impacts caused by subtle changes in the physical characteristics of high-density living, we may find an increasing need for new controls based on criteria unimaginable 10 years ago. As we begin to understand "the ecology of privacy,"[12] as Robert Sommer has called it, and learn of the effects of whether a door opens out or in, or a barrier is five feet high or six, we may see the need to adopt wholly new forms of regulation of the use of land, particularly in the high-density environment of the megastructure.

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[11] See George Sternlieb, *The Tenement Landlord*, p. 174 (1966).

[12] Robert Sommer, "The Ecology of Privacy," in H. M. Proshansky, W. H. Ittelson, and L. G. Rivlin, *Environmental Psychology: Man and His Physical Setting*, p. 256 (1970).

And even if the more advanced forms of enclosed cities are never built, a reexamination of legal concepts based on the megastructure model may produce innovations that would prove useful in more immediate situations. The legal relati[illegible]hip between the developer of a new town and its future residents and th[illegible]dents of the surrounding area is at present muddled and might benefit fr[illegible]arch.

Changing Concepts of Family

One of the most prominent features of the counterculture movement is its rebellion against the concept of the unitary family and traditional methods of rearing children. New forms of communalism are flourishing. Tolerance is expressed for a wide variety of relationships between people of different age and sex as alternatives to the traditional man-wife parent-child pattern.

Whether these trends will or should continue is beyond the scope of this paper. So are the substantial changes in the law of domestic relations—marriage, divorce, adoption, etc.—that would be needed to legitimize alternatives to the traditional family. But our land laws also revolve around the traditional family concept in more ways than one might realize.

The laws governing the inheritance of land, while somewhat more flexible than in the days of primogeniture, still are based largely on each individual's place in the traditional family hierarchy. So are such other legal institutions as dower, community property, and homestead exemptions.

The law of zoning uses the traditional family unit as its modular. From the simplest protection of the single-family home to the most complex density coefficient ratio, all residential zoning assumes one traditional mom-and-pop family in each dwelling unit. Where the system is challenged, whether by a haggle of hippies, a piety of priests, or an exemplar of ex-addicts, the system proves unadaptable.

If greater flexibility in the concept of family is to be encouraged, we should revise our laws governing the disposition and use of real property in order to remove the handicaps it now places on sharing property in ways not officially sanctioned by our forefathers.

These examples are merely illustrative of how new ways of using land demand reexamination of existing legal rules. If the new uses of land never come about, however, the insight offered by the examination of traditional land-use laws from a new perspective may open the way for progressive reforms.

Chapter 7

ECONOMIC POLICIES, ENVIRONMENTAL PROBLEMS, AND LAND USE

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INTRODUCTION

Research studies of the design of efficient, consistent, and reliable economic policies directed toward resolving environmental/land-use problems have been undertaken only during the past decade. Prior to the 1960's, economists generally viewed environmental problems as those "special nuisances" or freakish anomalies having little or no influence on the remainder of the economy, including efficient utilization of land. Residuals generation and other causes of environmental degradation were generally viewed as the unpriced "price of progress." With few exceptions (such as rare pollution disasters at Donora, Pa., Meuse Valley, and London), and apart from specific localized problems (like smog in Los Angeles), it was felt that these could be satisfactorily ignored.

The concept of materials balance, or conservation of mass energy and its implication that in the long run raw materials input must be approximately equal to the waste residuals generated, only permeated the economics literature in the late 1960's.[1] Spillover effects (nonmarket relationships between economic agents) are a central ingredient of man's relation to land; economists in the main have failed to recognize this, while planners and legislators often implicitly adjust for spillover effects in establishing policies for land use.

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*I am indebted to Marion Clawson, Harvey Perloff, and Donald McAllister who, without implying agreements, read an earlier draft of this paper.

[1] The seminal articles of economic enlightenment were the philosophical "spaceship earth" paradigm put forth by Kenneth Boulding and the analytical integration of input-output with materials balance by Ayres and Kneese. See K. Boulding, "The Economics of the Coming Spaceship Earth," in H. Jarrett (ed.), *Environmental Quality in a Growing Economy* (Baltimore: The Johns Hopkins Press, 1965); and R. U. Ayres and A. V. Kneese, "Production, Consumption, and Externalities," *American Economic Review*, vol. LIX (June 1969).

Consider the elaborate body of common and statute laws, the general acceptance of zoning ordinances, the extensive land-use planning in urban complexes, the provision of requirements in the Homestead Act and the historical movement toward public control, as opposed to public ownership of lands. As an economist looking backward on these largely pragmatic efforts, I am amazed how society has attempted (and succeeded) to internalize, at least partially, negative externalities without the aid of such theoretical foundations as public goods or "spillovers." In this discussion I shall take these pragmatic efforts and their economic rationale as given, and address the question of their efficiency and other positive values in the light of recent economic research.

I attempt to provide a brief review of the recent theoretical findings in economic research which may have an important impact on land-use planning and environmental policies. From these findings I then attempt an assessment of different economic signals in regulations and their organization for land-use problems. From this assessment and taxonomic description of types of controls and control agencies, a list of research priorities is developed.

We realized that externalities or spillovers are highly pervasive (or dominant) due to materials balance and the increasing agglomerations of people and industry in urban complexes. At about the same time we witnessed renewed interest in economic circles on exchange processes and property rights. Originating with the famous paper by Ronald Coase, an active debate emerged on whether private property rights or landownership rights are neutral, or cause inefficiencies in the allocation of land and other resources.[2] His article will not be reviewed here except to note that it dealt in detail with the problem of efficient application of taxes, standards, or subsidies by a regional water quality management agency.[3] The results can be generalized to many resource planning situations.

Another development in the economics literature relating to land use and environmental policy has been the elaborate analysis of the problem of public goods supply and valuation in a regional context. The theoretical modeling of spillover problems between autonomous local or regional governments has been of particular interest.[4]

There are many other related conceptual developments in this literature which have a bearing on environmental policy and land use, but to catalog them would require almost a volume in itself. What I hope to do is to provide a partial list of what I believe are the most important conclusions and implications of this literature.

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[2] Ronald Coase, "The Problem of Social Cost," *Journal of Law and Economics* (Oct. 1960).

[3] For a complete discussion of this issue through 1967, see A. V. Kneese and B. T. Bower, *Managing Water Quality: Economics, Technology, Institutions* (Baltimore: The Johns Hopkins Press, 1968). For a more encompassing but less precise survey, see E. J. Mishan, "The Postwar Literature on Externalities: An Interpretive Essay," *Journal of Economic Literature* (1971).

[4] See M. V. Pauly, "Optimality, 'Public Goods,' and Local Governments: A General Theoretical Analysis," *Journal of Political Economy* (May/June 1970), and M. Connolly, "Trade in Public Goods: A Diagrammatic Analysis," *Quarterly Journal of Economics* (Feb. 1972).

BRIEF REVIEW OF DEVELOPMENTS IN ECONOMIC THEORY APPLICABLE TO GENERAL LAND-USE PROBLEMS

1. In a world with perfect information (i.e., information and negotiation costs are zero and there are no stochastic or uncertain elements), all problems of efficiency can be resolved by private markets, provided all entities of society with positive or negative value are exchanged in well-defined, competitive markets.[5]

2. In worlds with less than perfect information, the achievement of efficiency without external control of certain exchange processes (or all of them in the case of pervasive externalities) depends on particular aspects or circumstances confronting the actors in each process of exchange.[6]

3. If individual behavior, and thus collective behavior defined as the sum of the effects of individual behavior, tends toward avarice, altruism, of neutrality with regard to the plight of others, then the value associated with "public goods" generally cannot be determined by noncoercive or indirect methods.[7] This is a generalization of the Samuelson problem of "free riders" for public goods.

4. Efficiency and other social aspirations, such as equity, security, opportunity, and freedom, cannot be easily separated, as suggested by the narrow welfare economics of the 1950's.[8] A continuum of Pareto-efficient

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[5] See K. J. Arrow, "The Organization of Economic Activity: Issues Pertinent to the Choice of Market Versus Non-Market Allocation," in *The Analysis and Evaluation of Public Expenditures: The PPB System*, Subcommittee on Economy in Government, Joint Economic Committee, U.S. Congress, May 1969. Arrow contends that the externality (or public good) problem arises because of a lack of sufficient competitive suppliers and/or demanders for the externality–public good. The conceptual economic problems of land use and environmental quality could, by implication, be resolved by a sufficient number of competitive traders with perfect information. This raises the question as to whether a major research effort could focus on how to achieve low-cost information and exchanges on property; i.e., make the speculative land markets completely competitive via government subsidy.

[6] See E. J. Mishan, *op. cit.*; C. Randall, "Market Solutions for Externality Problems," *American Journal of Agricultural Economics* (May 1972); R. C. d'Arge and W. Schulze, "The Coase Proposition, Wealth Effects, and Long-Run Equilibrium," privately circulated manuscript, 1972; and A. V. Kneese, R. U. Ayres, and R. C. d'Arge, *Economics and the Environment: A Materials Balance Approach* (Baltimore: The Johns Hopkins Press, 1970), ch. 3.

[7] See, for example, Robert H. Scott, "Avarice, Altruism, and Second Party Preferences," *Quarterly Journal of Economics* (Feb. 1972). For very enlightening discussions on how the value of public goods might be measured and problems encountered therein, see the articles by Bohn and Maler in Peter Bohn and A. V. Kneese (eds.), *The Economics of Environment: Papers from Four Nations* (London: St. Martin's Press, 1971), pt. III.

[8] See, for example, F. T. Dolbear, Jr., "On the Theory of Optimum Equality," *American Economic Review* (Mar. 1967), and W. Samuels, "Welfare Economics, Power, and Property," unpublished manuscript, Michigan State University, 1970.

possibilities exists for each set of N property doctrines where N-1 are given as the state of nature and the Nth is allowed to change. Thus, Pareto efficiency provides no guidance as to the "best" state of affairs unless all laws, rules, beliefs, and property rights are accepted as *immutable*. Also, there are serious questions as to whether psychological factors such as discrimination, fear, subordinance, and planned ignorance, conditioned by the distribution of property rights and power, substantially affect productivity and thereby efficiency considerations for the economy. Such a consideration not only plays a potentially key role in individual exchange but also in defining exchange possibilities between local and regional public agencies, and between the public and private sector in general.

5. If private negotiating or information costs are exceedingly high compared to costs of a public agency (assumed to be benevolent), then the public agency can determine and levy a system of effluent charges, property taxes, and/or subsidies which will make a system of preassigned property rights Pareto-efficient. In other words the public agency must have perfect information on the following structural characteristics of the economy: (*a*) it must know all technologies and possibilities for substitution of resources in production; (*b*) it must understand and account for all preferences of all citizens including future generations; (*c*) it must adopt an implicit or explicit weighting system to yield welfare tradeoffs between existing generations, past generations, and future generations; (*d*) it must completely understand the resource mass and relative scarcity and environmental assimilative capacity of all ecological systems capable of being used.[9] I do hope this list of qualifications indicates the difficulty and perhaps futility of developing "efficient," in a universal sense, charge or subsidy systems to regulate environmental degradation or any other public land-use problem.

6. Penalty and/or reward systems to equate private and social costs of individual actions, such as those advocated by many economists, are conditioned on the belief that two major, but often implicit, conditions hold in the economy. First, that firms (consumers) are profit (utility) maximizers with no concern for facets of organized behavior including quality, prestige, relative industry (income) position, growth, security, or other factors which do not immediately or ultimately reflect on the firm's profit (individual's utility). Second, that there is no inherent bilateral protective relationship between the firm (consumer) and the agency levying the penalty-reward system. There is mounting evidence that both of these presuppositions may not be generally valid.[10] I also have some doubts as to whether the information available to

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[9] See Kneese, Ayres, and d'Arge, *op. cit.*, ch. III, or Karl-Goran Maler, "Environmental Economics: A Theoretical Enquiry," soon to be published manuscript, 1972, ch. II. Also, in a recent article, Forsund successfully (in a conceptual model) integrated the spatial dimension into materials balance-general equilibrium using the Lefebre model as a starting point. See F. Forsund, "Allocation in Space and Environmental Pollution," *Swedish Journal of Economics* (Mar. 1972).

[10] The almost classical statements on these propositions are to be found in the writings of Duesenberry, Baumol, and Galbraith. The economics literature on these topics is immense, so, in respect to all, I shall cite none.

firms (consumers) is sufficient for them to make reasoned choices on responding to penalties or reward systems. Finally, stubbornness, dedication to ideals, and ego-fulfilling behavior have been recognized for some time in the social sciences; however, as yet they have not adequately permeated the literature on the economics of regulating firms' or consumers' behavior, except perhaps by the private sector through advertising. It is interesting in this context to note that the Weber-Fechner Law of psychological perception has yet to be adequately integrated into economic theory.

7. There is an increasing recognition by economists and others that exchange processes in urban and suburban areas have moved from a cooperative to a coercive stance.[11] Specifically, a greater proportion of total transfers of goods, services, and some other entities of value to individuals are exchanged not voluntarily but involuntarily. I do not mean to suggest that the "cowboy economy" cited by Boulding is currently being replaced by a "spaceship economy."[12] Rather, the "cowboy economy" of range wars, barbed wire, horse thieves and six-shooters has its modern counterpart in youth gangs, fear of traversing the streets at night (and during the day in Washington, D.C.), double locks on doors and the "Saturday-night special." Environmental degradation and externalities associated with pollution is just one example of a general failure by modern institutions and public agencies to cope with involuntary private transfers.

8. Given the concept of materials flow and equational balance between raw materials, throughput, and waste residuals in the economy, it is an easy step to deduce that *all* macroeconomic policies including stabilization, employment, and balance of payments have marked effects on environmental degradation and thereby on land use.[13] However, even theoretical analyses of these linkages are only in their infancy. Also, it is obvious, given the basically complemental relationships between raw materials flow and ultimate residuals generation, that subsidization policies such as the oil depletion allowance and agricultural price-support programs, have substantial negative but unpriced environmental impacts which are not currently capitalized into land prices (or mining royalties).

9. Another important dimension of recent economic research on land-related topics is the explicit recognition of a phenomenon called irreversibility. Irreversibility has been defined in many ways, but the concept used by economists boils down to the problem that once development of a land resource or entire ecological system occurs, it may not be returned to its natural state or be converted to other uses except at an unreasonably high

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[11] Buchanan and Tullock, among others, have noted this apparent long-term trend.

[12] Boulding, *op. cit.*

[13] For a rather general discussion of this point within the context of macroeconomic models, see R. C. d'Arge, "Essay on Economic Growth and Environmental Quality," *Swedish Journal of Economics* (Mar. 1971).

cost.[14] In consequence, the cost of making a mistake in land-use planning becomes markedly higher and a premium is thereby placed on correct decisions.

10. On the applied front, there have been numerous studies of land-use and environmental quality problems using quantitative methods. These range from the location of industries in a well-defined airshed to comprehensive spatial input-output systems which apply, to a limited extent, the concept of materials balance to analyze policies for managing air, water and solid wastes simultaneously. I wish to identify only one major methodological issue here. As a sometime builder of large-scale systems models, I have become convinced that there are two major problems associated with these efforts. There are two nonmutually exclusive informational barriers in the use of large-scale systems models presuming the land-use problem is always more complex than the model built to analyze it. One relates to the user/builder and the other to the comprehensiveness of the system. If the model is so complex as not to allow the user to understand why a certain outcome occurs, then the model has limited utility because the user will not know whether the result is to be believed. If the model is too complex, it cannot be solved with present programing, computer, or applied mathematical operations. The result is that either dimensionally small but rather complex *or* dimensionally large but simple (linear, deterministic) models tend to be built. As yet, no rigorous examination has been undertaken to discover when one of these types of modes is superior or where both need to be developed simultaneously for the same land resource problem.

11. It can be deduced from the emerging literature on environmental control that some of the traditional land-use controls, such as zoning, may be relatively inefficient. Specifically, typical zoning arrangements define a bounded range of activities for when land can be used. The social motivation for such controls is to minimize or reduce the effect of negative spillovers both within and between neighborhoods,. i.e., to control external diseconomies (although other motives may be prevalent, such as insuring rising prices for the zoning-induced scarce resource). Zoning viewed this way is a particular type of environmental standard which can be compared with other penalty-reward systems. It has recently been demonstrated that standards as opposed to pecuniary penalty/reward systems tend to be inefficient since there is excess supply elsewhere in the economy. Thus, there are imputed prices for the differential uses of land due to zoning, but the imputed prices are not charged, thereby distorting efficient resources allocation.[15]

To summarize these methodological issues and implications of recent research, it is becoming increasingly obvious (at least to me) that the private market paradigm and structure as it now is constituted cannot be successfully used for analyzing problems of land use and environmental quality.

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[14] See J. V. Krutilla et al., "Observations on the Economics of Irreplaceable Assets," in A. V. Kneese and B. T. Bower (eds.), *Environmental Quality Analysis: Theory and Method in the Social Sciences* (Baltimore: The Johns Hopkins Press, 1972), and also K. J. Arrow and A. C. Fisher, "Environmental Preservation, Uncertainty, and Irreversibility," manuscript (1972).

[15] See Kneese and Bower, *op. cit.*

It has been recognized for a long time that private markets not only fail to yield a socially acceptable result, they offer little or no *information* as to how one might achieve such an outcome. Problems of lack of information for private users and public agencies nullify any general statements or conclusions on the "theoretical" efficiency of land-use controls. Lack of complete understanding of psychological motivation negates the easy adoption of one type of control, such as user charges, over any other, such as subsidies. Seemingly unrelated macroeconomic policies appear to have pronounced impact on throughput and thereby environmental quality and land use. This suggests that the old methodological dichotomy of macro and micro might reasonably be scrapped.

It might be added that environmental quality has a verifiably strong feedback on the type of land use observed, e.g., wealthier neighborhoods develop upwind or upriver; air pollution excludes certain types of agriculture in the urban-rural fringe. We are coming to appreciate the extent of weaknesses of theories of public goods and natural resource utilization without explicit consideration of irreversibilities. We are also concerned about the almost dogmatic adoption of empirical models that work but do not answer relevant questions. This list, although too short and selective, indicates the state of flux that economists, in attempting to provide universal doctrines of efficiency for public land planning, find themselves.

A SIMPLIFIED TAXONOMIC DESCRIPTION OF A LAND-USE AND ECONOMIC POLICY SYSTEM

Now that I have suggested the existence of a rather wide trench between the economic theory and design of efficient land-use policies, at least with regard to environmental quality, I would like to suggest potential ways of spanning it. First, let us make a simple taxonomic division of the environmental/land-use problem into three not necessarily mutually exclusive parts:

- Actors and action systems;
- Social indicators and evaluative system; and
- Goals and social welfare system.

In the competitive market analogy, the actors and action system comprise the driving force made up of self-satisfying consumers and firms. These economic units respond to a set of price signals which they indirectly cause to respond to private wants and scarcities. Price signals, of course, are the only form of social indicator and evaluative system. The goals and welfare system are "internalized" in the competitive analogy, with the implicit requirement of "one dollar one vote" and the maximization of individual want fulfillment (with implicit equal weighting), which presumably yields the best outcome for society.

Alternatively, in the idealized Socialist system the driving force is workers' motivation to fulfill state-determined goals with an array of social indicators, most of which are nonprice measures. Both the goals and evaluative system are predetermined by the state vis à vis collectively defined attitudes and welfare weights. The United States, quite obviously, deviates substantially from the competitive or Socialist mold. Actors include public and private organizations as well as individuals, and the action system responds to a wide set of signals. These do not exclude prices but include many other explicit or implicit social indicators, denoted here as the social indicator and evaluative system.[16] The goals system is defined very broadly to include a large number of different definitions of social welfare and voting weights, depending on particular circumstances. Given this taxonomic conceptual view of the economic system, our next question is how can it be used to establish research priorities in environmental issues directed toward land-use control. Before proceeding to this, I shall point out how I presume this conceptual system can be used.

In a hierarchical planning system the set of goals and their weights would be prespecified for consideration in evaluating alternative land-use policies. From the set of goals, a disaggregated set of social indicators would emerge which provide signals to the actors in the system.[17] The actors in responding to this set of social indicators would maximize some weighted or unweighted set of goals. In a nonhierarchical situation the goals would be revealed via the desires and actions of the individual actors. The social indicators in this case would be nothing more than the set of signals confronting all actors. If land-use policies are attempts to remove the discrepancy between private and social goals, it would seem that the social indicators to which some (or all) actors are responding are incorrect. An attempt to equalize social and private costs of land speculation, for example, is an attempt to provide a new set of social indicators for the speculators and other affected parties. The new social indicator set in hierarchical planning emerges from a readjustment of the weights on the goals set of newly included dimensions. The social-indicator-evaluative system embraces all sorts of signals that affect decisions on land use, such as capital gains taxation policies on speculators and industrial zoning ordinances.

At this time I do not wish to enter the debate on whether planning is inherently hierarchical or not. The suggestions made for research will not generally concern the necessity of a hierarchical planning process, although I shall presume that a hierarchical set of values exists. That is, it is implicitly more important to fulfill social rather than private goals. Private goal fulfillment, of course, is generally one aspect of social goal fulfillment.

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[16] Social indicators are defined very broadly here to include any meaningful signal (one which does not generate complete indifference) to two or more individuals in society. For a different definition, but which is close to this one, see Department of Health, Education, and Welfare, *Toward a Social Report*, U.S. Government Printing Office, Washington, D.C. (1969).

[17] For an example of attempting to derive disaggregated goals to a social indicator "logical tree," see D. F. Peterson, R. C. d'Arge, H. Caulfield, and others, *Water Resources Planning and Social Goals: Conceptualization Toward A New Methodology*. Technical Committee of the Water Resources Center of the Thirteen Western States, Final Report C-2194, to Office of Water Resources Research, U.S. Department of the Interior, Sept. 1, 1971.

After this rather crude and brief introduction to the taxonomy of a particular planning system, let us now turn to the question of its usefulness in specifying research priorities for land use and environmental quality.

First, we can state that, in general, the actors who determine current land use patterns are:

- Federal agencies: Bureau of Land Management, U.S. Forest Service, National Park Service, Bureau of Public Roads, Bureau of Reclamation.
- Private landholders, including speculators, farm owners, businessmen, households, and conservationists.
- State and local private agencies.

All of these land-actors have one aspect in common, none of them take a holistic view of the land resource in any one region. Each are separate actors engaged in responding to, or acting upon, a limited set of social indicators.[18] Thus, the actors and action system in land use can be taken as a diverse group of individuals and organizations responding to different sets of social indicators. The social indicators range from short-term profits and tax advantages to ill-defined measures of the preservation ethic. The set of goals is perhaps as diverse as the number of distinct actors.

To achieve consistency and a better set of economic policies to regulate land use, it appears to me that at least four components of the taxonomy need substantial study. The first component concerns the mechanisms for deriving social indicators from vague and overarching goals such as preservation, economic opportunity, or environmental security. There appears to be a substantial chasm between the aggregate goals expressed politically in our society and the supposed response by actors in the system to the social indicators used.

An example of this chasm is the specification in Senate Document 97 that the basic objective of planning is "to provide the best use, or combination of uses, of water and related land resources to meet foreseeable short-term and long-term needs."[19] In Senate Document 97, goals defining "best use" include: "development," "preservation," and "well-being of people." The difficulty arises in translating these goals into social indicators. So far, most if not all of the translation has been left to the actors themselves. They are partly constrained by the requirement that indicators arising from private markets are to be used in benefit-cost calculations.

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[18] The question can be raised whether class action suits or "public trust" doctrines may ultimately force such separate actors to engage in a more comprehensive approach to land use planning. See J. L. Sax, "Legal Strategies Applicable to Environmental Quality Management Decisions," in Kneese and Bower, *op. cit.* Also, the National Environmental Policy Act of 1969 (P.L. 91-190) and sec. 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 191-611) appear to have this impact.

[19] The President's Water Resources Council, *Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources*, U.S. Government Printing Office, Washington, D.C. (May 1962).

In my opinion, what is needed is research into translating overarching goals into consistent and viable sets of social indicators for land-use policy. By focusing on one goal (development) and confining the social indicator set to one measure (net national product (NNP)), economists have been able to devise an elaborate (and useful) translation of a goal into a social indicator. With the social indicator (NNP), autonomous actors in the public sector can be *channeled effectively toward responding* to this indicator. What is lacking is the same translation process for nonmarket goals.

Several additional recommendations can be made regarding research on this translation process for land use. First we should find meaningful aggregate social indicators for goals which are not time and location-specific, at least if one adopts the economic paradigm of translation. If they are location-specific, cohesion and consistency of response by actors may be difficult, if not impossible. Thus a few homogeneous measures of environmental quality aspects, such as esthetic appreciation indices, distortion of natural landscape, and symmetry are needed. Perhaps an index of gross ecoproduct (national production of mass energy) would be useful.

Second, perhaps a "logical tree" expressing the interdependence and disaggregation of overarching goals into social indicators could be derived. For example, a simple tree might be as follows:

Goal	Sub-Goal	Social Indicators
Development or Economic Opportunity	Standard of Living	Per capital income
		Distribution of income
		Income stability
		Price stability

The logical tree would contain explicit linkages between overarching goals, such as preservation or economic opportunity, and measures of performance or social indicators as to goal fulfillment. I am not advocating that research on policy analysis for land use be directed toward identifying the entire social welfare function. But relationships particularly embedded in existing values associated with land use should be examined; e.g., what goals are being fulfilled by the 160-acre limitation specified under the Land Reclamation Act of 1902, and how can these goals be measured? I do not expect studies of goal translations to be funded readily because of their inherently political nature, but now that my plea has been made, let us turn to more "scientifically" pressing research needs.

The second major component of the taxonomy needing study concerns how actors and the action system respond to changes in perceived social indicators and/or constraints. If economic policies are directed toward changing the signals confronting land users and decisionmakers on public lands, do we understand their behavior and underlying motivations well enough to predict responses accurately?

Conventional wisdom in economics, commencing most importantly with Pigou, has postulated that most problems of land use involving spillover effects at the microscale can be managed and resolved through the application of charges, subsidies, or taxes. Polluters should be taxed (or offered a subsidy for reduction in waste emissions) for the amount of societal damages their wastes induce. Those contributing to congestion or noise should be taxed according to the social costs they generate. Owners of junkyards causing blight should be charged according to the increment of their building to psychological, health, economic, and esthetic damages that occur in slums. Land speculators who carve up the landscape prematurely for housing developments to increase "site appeal" should be charged according to the esthetic damages, soil runoff problems, and other damages ignored in their response to private incentives. Thus, according to the conventional wisdom, individuals and private or public organizations can be made publicly responsive, not only to their own gains but also to damages or losses they cause which are not priced in markets.

Such taxation schemes have been called many names, including user charges, traffic tolls, effluent charges, congestion fees, discrepancies between social and private costs, sewer charges, and social bounties, depending on the land-use problem they are to resolve. But all contain the implicit assumption that individuals, firms, and public enterprises will not respond in a socially efficient manner unless penalties or incentives are imposed. This statement applies to other types of restrictions, including effluent standards, zoning ordinances, and maximum permissible vehicle emission rates. In these cases, however, the penalty-reward structure for noncompliance is different. Residents of the urban and suburban complex are viewed as an amorphous mass of individual "globules" of self-serving desire, each pursuing his own end without consideration of the social consequences. Very few studies have been undertaken to verify if such penalty systems actually work.

Economists have paid much attention in recent years to questioning when charges, subsidies, and standards will yield the necessary and sufficient conditions for an optimum adjustment in a market-oriented economy. There also has been much theoretical analysis concerning the possibilities for private negotiation to resolve externalities, the effect of transactions costs on resource allocation, and the effect of Pigovian taxation systems in a general equilibrium planning contaxt. What appears to be missing is a complete analysis of the relative efficiency of different environmental planning systems which includes not only the type of controls to be selected, e.g., taxes or zoning ordinances, but the type and structure of the planning organization responsible.[20]

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[20] Recently, several researchers have begun to analyze alternative types of environmental control agencies or management systems and their relationship to the efficiency and other performance properties of management strategies or controls. See B. T. Bower and W. R. D. Sewell, *Selecting Strategies for Air Quality Management*, Resource Paper No. 1, Policy Research and Coordination Branch, Department of Energy, Mines and Resources, Ottawa, Canada (1971); T. D. Crocker, "On Air Pollution Control Instruments," Working Paper Series No. 8, *Program in Environmental Economics*, University of California, Riverside (Aug. 1971), and L. E. Craine, "Institutions for Managing Lakes and Bays," *Natural Resources Journal*, vol. 11, No. 3 (July 1971).

Some simple conceptual hypotheses on the nature of control institutions and economic control strategies are briefly developed here. From these conceptual hypotheses on the "actors and action system," I will attempt to list a set of research priorities on the basis of the taxonomy presented.

LAND-USE CONTROL STRATEGIES AND DEGREE OF DIRECTNESS

The first and perhaps taxonomically useful distinction that can be considered is between direct and indirect controls or management strategies. Direct controls are those which are applied at, or to, the source of the urban problem, with sufficient penalties to make avoidance extremely costly. The continuous monitoring and closing down of a particular factory emitting sulfur oxides, if the factory exceeds a predetermined emissions standard, is an example of such a direct control. Banning slow-moving trucks from city streets and turning away campers at national parks at peak congestion periods are also direct controls. Direct controls leave little or no latitude for private decisionmaking. There is only a single link of causation which is predetermined between agency action and response of affected parties. The price of failing to comply is always established at a level high enough to insure almost universal compliance.

Indirect controls are identified here as those management strategies with at least two links of expected causation between problem source and application of control. Examples include Pigovian taxes or subsidies which contain a behavioral postulate or relation and a technological relation. The behavioral postulate is that if the polluting firm is taxed for waste discharge, it will avoid this charge as much as can be done efficiently by altering production, adopting waste-controlling technologies, relocating, or some other legal means. The technological link specifies that if the firm reduces or alters waste discharge by a certain amount, then societal losses will be reduced to a predetermined level.

A second example of a less-direct control strategy is the application of a gasoline tax which is presumed to induce individuals to drive less and in consequence reduce automotive emissions. Two aggregate links appear in this example. The first link is behavioral, postulating that vehicle operators will actually reduce mileage such as by taking alternative modes of transportation, making each trip more efficient, or driving vehicles with improved gasoline mileage. The second link is a technological one postulating that if mileage driven is reduced, so will damages attributable to exhaust emissions.

The major distinguishing feature between direct and indirect controls according to the above definition is that direct controls contain fewer links. Thus, direct controls, because they remove the uncertainty of reaction to a control, are more rigid and authoritarian in character. It appears, however, that most economic controls to date have been mixtures of direct and indirect linkages.

Traffic signals are a case in point. The law requires a stop for a red light, but if it is not obeyed and the violator is caught, he is penalized. The penalty, however, is usually not high enough to command universal obeyance. Zoning laws with variance and penalty provisions are also such indirect control strategies. A zoning ordinance is adopted but contains variance provisions. The behavioral relation is the expectation that most affected parties will comply and not request variances. The technological relation is simply goal fulfillment in the community via homogeneity in types of land-use activities.

Linkages, even in the apparently simplest control strategies, can be quite complex and require a lot of information before the satisfactory implementation of control strategies. While on the surface the gasoline tax example given earlier appears to be relatively simple, if we probe slightly deeper its potential complexities will unfold. The technological link between mileage driven and exhaust emissions is weaker than one might think on the basis of the principle of conservation of matter-energy. It has been carefully documented that not only the mileage driven but also driving modes, i.e., acceleration, stopping, etc., have markedly different impacts on exhaust emissions of reactive hydrocarbons, carbon monoxide, and oxides of nitrogen. In consequence, at least one additional relationship must be analyzed between gasoline taxes and vehicle emissions; namely, the possibility that a gasoline tax would unexpectedly increase vehicle emissions by encouraging vehicle operators to drive shorter distances in slower traffic to reduce gasoline consumption. A net impact on vehicle emissions should therefore be calculated, comparing their reduction due to reduced vehicle mileage with potentially increased emissions due to changes in mode of vehicle operation. If all driving was of a similar mode, such as on city streets, then analysis of this relationship could be omitted, but it may be necessary for urban complexes with both streets and freeways, such as Los Angeles.

A second potential difficulty may arise with the behavioral relationship between gasoline taxes and automotive emissions. Increased gasoline prices may stimulate the purchase of automobiles with better gasoline mileage; i.e., vehicles with engines containing fewer cubic inches but often compensatingly higher compression ratios. There is some evidence that engine size and emission rates of certain pollutants are not correlated, or even tend to be inversely correlated. To cite an extreme example, in testing 1971 model year automobiles, the U.S. Government found that the emission rates per mile of hydrocarbons and carbon monoxide were at least 50 percent higher from a vehicle with 79 cubic inches than one with 472 cubic inches.[21] Other data collected in the same tests also indicated a slight negative correlation between cubic-inch displacement and emission rates of hydrocarbons and carbon monoxide. Thus, the link between engine size and emission rates is not necessarily positive. Consequently, a gasoline tax which encourages the use of vehicles with smaller engines may have no effect or even a negative effect on automotive emission rates.

What the gasoline tax example clearly points out is that more information is needed before implementing indirect controls or there is a likelihood that such controls will be ineffective. If one views the direct-control and indirect-control dichotomy as a single spectrum, starting with absolutely enforced controls on a known source and proceeding to more behavioral linkages in indirect controls, it appears defensible to assert that information requirements (and thereby costs generally) increase as more indirect control strategies are employed. This assures that each control achieves the same impact.

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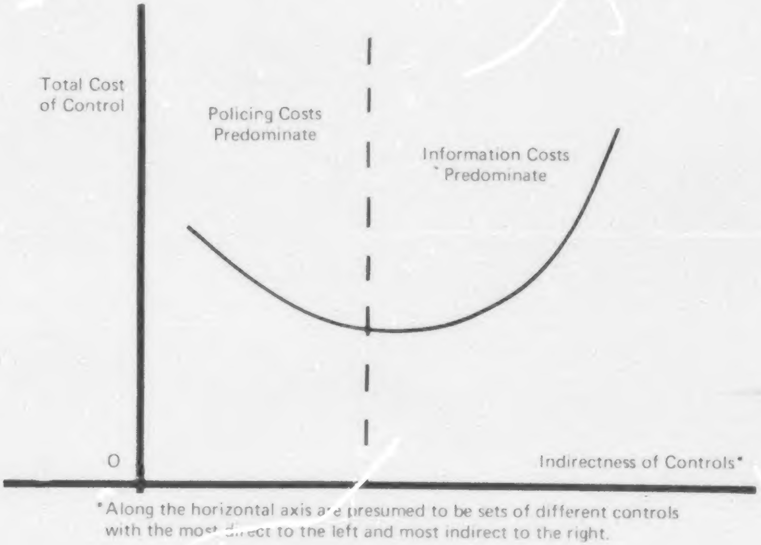
[21] See the *Federal Register*, Washington, D.C., vol. 36, No. 70 (Apr. 10, 1971).

Even very direct controls may embody high information costs. They require accurate monitoring and information on the technical relationship between reduced pollutant emissions, or traffic congestion, and an improvement in environmental quality. But generally, the more indirect the control, the greater the information costs, if it is to be satisfactorily implemented or even compared with other controls in terms of efficiency. For example, a desired pattern of land use might be achieved through zoning or by a more indirect control such as differential land-use taxes. But the assessment of taxes on land-use patterns requires a priori substantial research and perhaps experimentation.

Alternatively, enforcement and monitoring costs for rigid direct controls may be exceedingly high. If the perceived level of control is too oppressive to the individual or organization being regulated, nonlegal, questionably moral devices or political pressure may be applied to thwart or neutralize its impact. Such actions will at least waste resources in their attempted implementation and at most induce a serious misallocation of resources.

In figure 7.1, a simple graph is given taking into account rising policing and enforcement costs as the degree of indirectness of the control decreases. From



*Along the horizontal axis are presumed to be sets of different controls with the most direct to the left and most indirect to the right.

Figure 7.1 Policing and Enforcement Costs in Relation to the Indirectness of Control

the standpoint of an economist, an optimum indirectness exists which balances the incremental costs of enforcement and information. Such a comparison, however, presumes that information costs are known before the control is attempted. This is not usually the case. While the simple description of assumptions necessary for deducing a diagram like figure 7.1 is relatively easy, at this time we have no empirically based knowledge as to the shape or dimensions of such a curve, or even what factors are relatively more important in determining the cost of various control strategies.[22]

Potentially important factors in determining where a set of controls should be applied, and to what degree, are the number, type, and cost of alternative methods of control available to those who must, or should, respond to the governmental control effort. Thus, a purchase or excise tax on steel buyers which reflects sulfur oxide damages induced by emissions from the coking process is an indirect control, in that purchasers of steel are presumed to adjust their demand and thereby reduce production and emissions. It is obvious that steel purchasers have fewer methods of control; i.e., their only options are to reduce demand or possibly negotiate with the steel producers. Alternatively, the steel manufacturer can use precipitators, sealants on coke-oven doors, relocate or redesign the coke ovens, or institute almost any conceivable process change which is less costly than paying a sulfur emission tax.

Another illustration of the problems in selecting where to apply controls can be demonstrated with automotive emissions. If the entire control effort is directed toward automobile manufacturers, such a control strategy would probably be efficient in encouraging the adoption of technical alterations in engine design, vehicle weight, and other factors determining emission rates. Such a control strategy, however, would have little or no effect on alternatives available to motorists such as mileage driven or, most importantly, individual

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[22] Let D, I, P, and Q represent an index of indirectness of controls where D is the number of behavioral and/or technological linkages, I the amount of information used to judge whether a control is effective, P the amount of enforcement provided to insure reasonable effectiveness of the control, and Q the level of waste emissions, acreage of land impacted, or some other measure of magnitude of the control, respectively. Then, the cost of the control relationship can be assumed where C denotes total control costs:

$$C = \phi(D, I, P, Q)$$

The assertions in the text on the nature of control costs can be set forth simply in terms of this functional relationship. Let C_i denote derivative with respect to the ith argument, then:

$$\begin{array}{ll} C_{ID} > 0 & C_D \gtreqless 0 \\ C_{PD} < 0 & C_I > 0 \\ C_{QD} \lesseqgtr 0 & C_P > 0 \\ C_{IP} > 0 & C_Q > 0 \end{array}$$

Note that sufficient conditions for a U-shaped cost relationship are not stipulated.

vehicle maintenance. If controls are levied only on vehicle operators, the technical options cited earlier would only be influenced indirectly through shifts in consumer demand. With automotive emission taxes or standards established by regular vehicle inspection, vehicle owners could be expected to demand (and be willing to pay a premium for) vehicles with relatively low emission rates and emission control devices with low-cost maintenance. This would indirectly induce manufacturers to respond positively toward technical alternatives of control. Also, if zoning ordinances restrict the type of business activity by land area (i.e., industrial versus commercial), response to such zoning by potential entrants is limited; manufacturers can locate only in legally acceptable zones.

It is not apparent, however, that zoning ordinances are applied in such a way as to affect directly those with the greatest number of options to improve environmental quality. For example, an area is zoned for industry and slowly expanded as the demand for new industrial sites increases. Industries locating within that zone, if it is upwind of urban areas, may be required to meet exceedingly rigid air emission standards. If zoning prohibits consideration of industrial siting downwind, then the number of options for avoiding control costs and social damages by industrial firms is reduced. Ideally, a flexible zoning system should be studied where zoning arrangements change, according to the magnitude of social damages resulting from alternative industrial sitings.

While restrictive and well-conceived controls may be relatively efficient in reducing spillover effects, they may preclude some degree of consumer choice. By precluding choice, efficiency of controls may be increased, but at the expense of efficiency for the economy viewed as a whole. To illustrate this point, let it be assumed for the moment that there is a particular change in engine design that will reduce emission rates substantially but also reduces vehicle performance. Some vehicle owners may wish to pay substantial penalties in order to retain performance. Under a system of direct engine design controls on all vehicle manufacturers, such options as high performance would not be available and thereby impede consumer choice.

A similar problem arises with inflexible land-use regulations which "lock in" all but incremental shifts in land use at the suburban fringe. The result would be Pareto inefficiency in the economy, since someone could be made better off (those preferring high performance) without making anyone else worse off (society would be compensated for damages induced by high-performance vehicles). Of course, if relatively direct controls applied to automobile manufacturers are much less costly to implement than relatively indirect controls on vehicle owners, it may be efficient to use them even though some consumer choice is forgone. In this case, the difference in cost between operating controls on vehicle owners and manufacturers (or application of strict zoning ordinances) should be greater than the social benefit derived from greater consumer choice. At this time, however, I am unable to find one study of the magnitude of loss in consumer choice resulting from zoning and other forms of control to reduce neighborhood spillovers.

Theoretically, these problems have not been satisfactorily analyzed by economists, since they essentially involve adding or subtracting the right to purchase a commodity from individual preference relationships. Thus, they are total rather than incremental in concept and market prices do not offer useful measures of value.

I am suggesting that the optimal selection of types of controls, and where they should be implemented, apparently depend on their information costs, effectiveness, the number and cost of technical alternatives available to those affected by the control and its impact on private choice. An appealing criterion for selecting where controls should be implemented could be to apply controls on those with the greatest number of technical or behavioral alternatives. Such a criterion, however, may be inefficient unless the sum of the costs of implementing the control, plus the cost of the control devices, can be shown to be less than would apply if controls were levied elsewhere.

Controls can be expected to be more direct or rigid for those with greater access to technology alternatives for reducing spillover effects. In consequence, this is a second reason for believing that the more direct the control, the more likely it is to be less costly for society to apply it. It also suggests that contrived experiments should be made to evaluate alternative land-use controls before their widespread implementation.

Distortions between social and private costs may arise from the implementation of controls per se. As an example, excessive new land taxes may be costly to a society which is already burdened with too many negative psychological reinforcements. The control may be designed to eliminate discrepancies between private and social cost arising from technological or behavioral spillovers, but in doing it may create new spillovers. Numerous hypothetical and historical examples can be cited to illustrate such control-induced externalities. An obvious one of the behavioral type is where a relatively discriminatory land-use tax system has brought about attempts (and expenditures) to avoid the tax illegally. The effect of the control is therefore to channel expenditure toward negatively productive enterprises in the economy.

A less clear and potentially more pervasive type of externality, resulting from implementing controls, arises when inefficient control strategies are coupled with an economy having imperfect information or signals available to the actors. One example is encountered in zoning ordinances which are geared to resolving existing neighborhood spillovers they do not consider adequately how future land-use demands will respond to the current imputed prices of the zoning ordinance. Typically, in California we observe a local zoning plan to internalize neighborhood spillovers but not regional spillovers. Urban sprawl occurs without adequate provision of closely located industrial siting. This induces the construction of more freeways, which allow continual urban sprawl with increasing separation of worksite and home location, and thereby more congestion and air residual problems. Instead of the tyranny of small market decisions resulting in externalities and inefficient resource allocation, we observe the tyranny of small government decisions, via zoning, dominantly contributing to regional spillover problems. The basic problem emerges from an imprecise or nonexistent set of common signals among the various actors, i.e., local and regional, in attempting to resolve neighborhood and regional spillovers simultaneously.

The U.S. Government's control strategy for vehicle emissions so far has emphasized new vehicle emission standards, but left to the manufacturer all technical decisions to achieve these standards. Thus, the actors (the auto manufacturers) in this system are allowed to respond to any imprecise set of signals in order to achieve a desired (but incompletely defined) outcome. The automobile manufacturers are developing catalytic exhaust reactors with relatively low fixed costs but high operation costs, rather than other devices of a thermal type with potentially high fixed costs but lower maintenance costs.[23]

Whether catalytic reactors will be more efficient is unclear now; what is clear is that even if they were not, they would be adopted if automobile manufacturers were allowed to make this decision. The reason is, of course, that it is more costly for manufacturers to charge a higher price for their product directly than to pass on higher servicing charges to consumers. This would not happen in a purely competitive static market, where all consumers had complete information prior to purchase, nor would it necessarily happen if less indirect controls were adopted. Further, the decision to emphasize catalytic reactors has induced expenditure on this particular type of technology. Whether such expenditure is an efficient allocation of research funds is at least debatable, given current assessments of other possibilities including the external combustion engine.[24]

The choice of catalytic reactors will require the elimination of lead additives in gasoline, and thus gasoline with a higher "natural" octane rating will have to be produced. It has been hypothesized that such high-octane gasolines without lead will cause greater emissions of olefins and other complex reactive hydrocarbons. Although it is not yet known whether olefins or lead is the more [illegible] pollutant in urban environments, a decision for catalytic reactors has already implicitly been adopted.[25] The indirect-control strategy of new automobile emission standards contains dynamic and uncertain elements which, if left to the choice of private and profit-seeking manufacturers, may lead to new unregulated spillovers arising from the health effects of olefins or unexpected vehicle operating costs.

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[23] For a complete discussion, see J. S. Bain, "The Technology, Economics, and Industrial Strategy of Automotive Air Pollution Control," *Western Economic Journal* (Dec. 1970).

[24] See R. U. Ayres and R. P. McKenna, *Alternatives to the Internal Combustion Engine: Impacts on Environmental Quality* (Baltimore: The Johns Hopkins Press, 1972).

[25] An example of such potentially pervasive decisions is found in the State of California's efforts to control automotive emissions. Emission standards were established for carbon monoxide and hydrocarbons for vehicles made after 1965. To meet these standards, automotive manufacturers altered engine design to increase combustion efficiency and thereby meet the State standards. While hydrocarbon and carbon monoxide emissions for vehicles manufactured from 1966 through 1970 had a significant downward trend, increased exhaust temperatures which accompanied increased combustion efficiency induced a significant positive trend in emissions of oxides of nitrogen, a principal ingredient of photochemical smog. See R. C. d'Arge, "The Economics of Controlling Automotive Emissions," *California Air Environment*, University of California (Sept. 1970).

Given this discursive discussion on direct and indirect controls, can some assertions be made? I think so. Controls with more directness tend to be favored over less-direct controls because the linkages between cause and effect are fewer in number. Land-use zoning and regulations (not explicit pricing systems) on the use of public lands are examples of existing direct controls with relatively few behavioral linkages. A less-indirect control than Pigovian taxes or charges contains by definition fewer behavioral linkages and thereby implies fewer uncertainties. Thus, information costs tend to be lower for controls which are more direct. However, policing and monitoring costs may become prohibitively high if controls are too direct. With more behavioral linkages, taxes and charges will tend to be more complex than direct controls, and there is apparently a premium associated with simplicity in public decisionmaking. Generally, applying less-indirect controls means that the controls can be channeled more efficiently toward firms or households with the largest number of alternatives for meeting the standards, requirements, or rules (or avoiding penalties legally) as stipulated by the control-setting agency.

CONTROL AGENCY STRUCTURE AND DIRECTNESS OF CONTROLS

Our previous discussion emphasized the type and efficiency of different controls by examining the degree of the control's directness. A supposition existed that a control agency could be devised to implement any set of controls efficiently. The problem arises, however, that once the control agency is established through authorization, funding, and listing of responsibilities, constraints may be placed on it which would preclude analyzing certain types of controls. To illustrate this, typically in the United States, land-use agencies are authorized to consider issues only within precise geographical, hydrological, or institutional boundaries. These agencies may or may not be given the power of taxation, condemnation, and arbitration. In consequence, the set of controls which the agency may consider are often partially or completely established when the agency is formed. Usually the effect of such restrictions is to determine in very rigid terms what types of controls an agency will consider as feasible or within its domain of legal authorization.[26]

The initial structure of the agency may determine to a substantial extent the background and prior training of agency personnel. A control agency which is initially developed for purely environmental monitoring purposes is likely to have substantially different types of personnel than one with more inclusive environmental protection or control functions. And it is unlikely that the perceived set of feasible controls will be the same if there is a substantial difference in background and training of agency personnel resulting initially from the mandate and functions of the control agency.

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[26] A well-documented case of agency restrictions and their effects on the possibility of selecting efficient controls was completed by R. K. Davis on the U.S. Army Corps of Engineers efforts to improve water quality in the Potomac River using low-flow augmentation. See R. K. Davis, *The Range of Choice in Water Management: A Study of Dissolved Oxygen in the Potomac Estuary* (Baltimore: The Johns Hopkins Press, 1969).

These rather simple statements lead me to the conclusion that the type of control agency, as defined by its initial structure, function, and mandate, is not separable from the degree of directness of type of controls it will consider. From an economic standpoint, if agency structures or public actors in the system are entirely separable from their domain of responses or strategies of controls, then any agency structure which can accomplish its predetermined goals at minimum cost is preferred. The agency structure need not be considered beyond selecting the one with the minimum operating and administrative costs. Also, types of controls can be selected which yield the minimum sum of damages, control costs, and costs associated with application of controls, without consideration of the institutional structure of the agency imposing them. The effect of inseparability is to require, from the standpoint of an "ideal" set of controls and control agencies, simultaneous decisions on the function and type of control agency as well as the type and directness of controls. Otherwise, a control agency may be developed which is incompatible with the least cost type of control measures.

This conclusion, however, although simple, may not be practicable; it is unlikely that some governing body would have the requisite information to make all such decisions at one point in time. This is particularly true in the environmental control field where most commonly a problem is not identified until it attains a potentially drastic level; e.g., global dispersion of DDT, emissions of oxides of nitrogen. Consequently, a simultaneous decision on the control agency structure and domain of admissible controls would not be likely because of informational constraints and lack of adequate prior experimentation. In fact, the control agency, in most instances, would also be responsible for information gathering and processing on alternative types of control strategies. It can perhaps be taken as a datum that a particular type of control agency will be developed before all or even a small number of environmental control issues or strategies have been identified. If this is the case, then a set of criteria partly reflecting the potential range of problems and controls should be developed to evaluate alternative types of control agencies.

A SIMPLE DESCRIPTION OF THE ENVIRONMENTAL PLANNING PROCESS

A description of the taxonomic elements in a planning process which would exist, regardless of agency structure or management strategy, should be set forth in order to make realistic judgments on the type of control agency desirable for resolving environmental issues. I have developed a tentative (and certainly incomplete) list of seven phases which may characterize the process of environmental and land-use planning regardless of the institutional structure of the agency or management strategy. These are:

(1) Perception of the environmental problem in relation to land use.
(2) Initial information processing by public and private actors on environmental consequences.
(3) A tentative set of management strategies set forth and studied with public and private actor participation.
(4) Additional information acquired on specific costs and impacts.
(5) Selection and implementation of management and/or control strategies for resolving the environmental problem.
(6) Additional information acquired on effects of control strategies in resolving problems.
(7) Revision of management strategies to yield greater efficiency of control or to achieve other criteria.

Given this perceived dynamic structure identifying the environmental decisionmaking process, the next step is to develop explicit criteria in order to evaluate and compare alternative types of control agencies. I will discuss briefly seven potential criteria; but there may be others important in particular planning situations. The seven are:

(1) Efficiency in terms of cost. The measuring rod for comparison is quite simple for this criterion, namely, how much does it cost to operate a particular agency of type A compared with, say, an agency of type B, where A and B designate differences in mandate, geographical responsibility, jurisdiction over waste residuals, institutional structure, or some other factors identifying differences where a choice must be made. Of course, if agencies of types A and B are to be compared adequately, both must accomplish identical objectives in terms of land use and environmental quality management; if not, they cannot be compared on the basis of cost efficiency. In such cases, additional criteria on priorities of solving particular environmental management problems should be introduced in order to utilize efficiency criteria in selecting alternative types of control agencies.

(2) Reliability of the control agency in resolving management issues. This criterion is perhaps highly related to jurisdiction and the extent of power given to the agency under its original mandate.

(3) The extent of changes in the existing social structure or set of social, cultural, or heritage values necessary to accommodate the particular type of control agency and its extent of power.

(4) The speed with which the control agency can proceed through phases 2 through 7 (previously listed). Speed of instituting management controls appears to be especially important wherever slight delays may cause irreversible impacts on the resiliency of a particular food chain or other ecological cycle. A related criterion is how rapidly a particular type of control agency can alter management strategies once they have been imposed. As an example, if court suits are allowed to be initiated each time there is a change in provisions in zoning ordinances, it is doubtful if such changes would be efficient;

(5) Simplicity and degree of public understanding of the control agency and how it operates. An agency with a very complex mandate or set of

jurisdictional powers may have difficulty in responding to the first phase of environmental decisionmaking because the public does not understand who is responsible for resolving environmental conflicts.

(6) The amount of information costs encountered for implementation of management strategies. A purely public control agency may find it difficult to obtain residuals information from emitters unless they themselves are directly involved in agency decisionmaking. This is perhaps one of the contrasting features between river commissions in the United States, which have only public representation, and Genossenschaften in West Germany which has explicit emitter representation on governing boards. Whether information costs in the United States are actually higher has not yet been documented, but it would seem likely that they would be.

(7) The flexibility of the control agency in responding to new types of environmental problems.[27] A particular type of agency may have relatively low information costs and efficiency in control as well as simplicity and reliability. It may induce few social structure changes, but be totally moribund toward analyzing new problems. How one can build this type of flexibility into control agencies remains to be studied, but I would suspect that as such flexibility increases, the more diversified or interdisciplinary is the planning staff of the control agency. Such diversity, however, may preclude excellence in designing specific management strategies, so there is a potential price for such flexibility.

The list of possible criteria for evaluating different types of control agencies is undoubtedly very large and the list of seven very briefly described here is meant to be no more than suggestive. However, I hope I have established that the structure, mandate, and jurisdiction of control agencies will determine their value in resolving unforeseen but continuously appearing environmental problems and the types of management strategies that will be considered. In the same way, management strategies established by the governing body will partially dictate the mandate and jurisdiction of control agencies and thus their efficiency, information costs, flexibility, and other "outputs" of the agency.

I would like to suggest several tentative hypotheses about the relationship between control costs, directness of controls, and agency structure and mandate without giving supporting evidence. In order to simplify, I would suggest two organizational types for control agencies. Type A has an engineering orientation, a single purpose in scope and monitoring as a major function. This type would normally be typified (with regard to control efforts) by adopting rigorously enforced standards, regulations, or zoning ordinances which are politically determined outside of the agency.

Type B would contain a broader interdisciplinary orientation, a multiple-purpose scope, and monitoring and enforcement as subsidiary fun[illegible]pe

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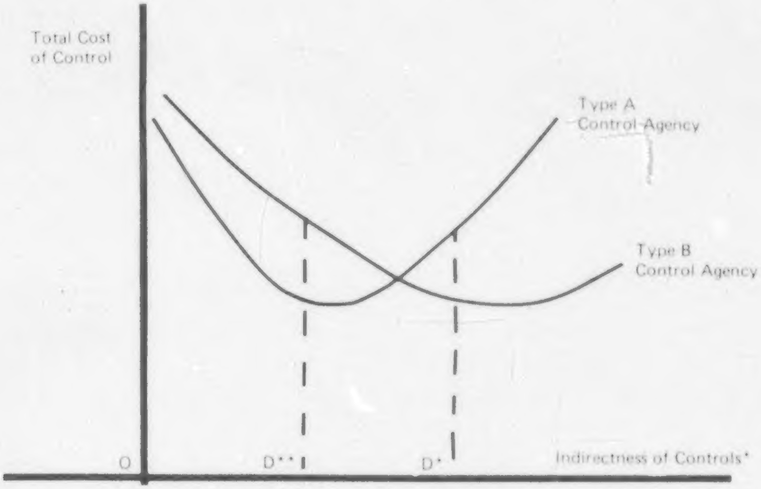
[27] An example of this criterion is the realization by the Bureau of Land Management administration that on southern California desert lands their role is essentially changing in emphasis from land-use supervisor to policemen. How easily BLM can respond to its new role relative to other types of control agencies indicates what I have in mind in applying this criterion.

B might be typified by the use of a wider spectrum of controls, including indirect controls of the tax-subsidy type or those, even less direct, which apply only to generally related activities. Perhaps both types could be placed into a single "super" agency, but the structure of "naturally" evolved natural resource planning agencies observed in the United States makes it doubtful.

The type A, given its single-purpose orientation, e.g., to increase the average level of dissolved oxygen in a river or reduce photochemical smog in the air, would undoubtedly be more efficient in achieving a particular level of control at least cost using fairly direct controls. Alternatively, the type B agency, while not as efficient in applying direct controls, may be more efficient in applying indirect controls to achieve the same environmental quality improvement as agency of type A. Such a hypothetical case is depicted in figure 7.2.

The set of direct controls indicated by *D*** in figure 7.2 can be implemented at less cost by an agency of type A, since such an agency can undoubtedly achieve lower monitoring and administrative costs with specific jurisdictional powers to enforce controls. Alternatively, when the control strategy is relatively indirect, the agency with broader jurisdictional powers and ability to utilize indirect controls could be expected to be more efficient. This case is depicted by the point *D** which indicates relatively indirect controls, type B agency hypothetically having lower costs than type A. Of course, there will be a large number of alternative configurations of agency structure and mandate intermediate between A and B and perhaps different orientation. But what is important to note is that depending on the structure (or directness) of



*Along the horizonal axis are presumed to be sets of different controls with the most direct to the left and the most indirect to the right.

Figure 7.2 Total Cost of Control Versus Indirectness of Control

control strategies, different types of control agencies might be more or less efficient than others in achieving implementation.

To summarize my points of view thus far, decisions on resolving environmental management problems require the careful choice of both control institutions and control strategies. Yet, as we embark on resolving land-use problems which are environmental in nature, we have perceptively little research on what constitutes an efficient institutional-control system. A much more comprehensive mandate and jurisdiction must be designed for a control agency that is considering the use of extremely indirect but perhaps more efficient control strategies.

In addition, since many environmental problems cannot be adequately foreseen, criteria other than cost efficiency should be considered in deciding on the structure of the environmental control agency.

CONCLUSIONS AND RECOMMENDATIONS FOR RESEARCH

Ideally, in land-use planning we should be able to identify precisely the extent of a particular environmental problem and to suggest the best (or at least second best) strategy for solving it. The best strategy would involve decisions regarding the type of control agency or institution, the type of controls to be applied, and the evaluative system to assess performance. Of course, such an idealized decision process for planning is unlikely ever to be achieved. This conceptualization, however, I believe, suggests where the highest payoff in research might be in planning our land resources to be compatible with principles of human and natural ecology. First, we need intensive studies of components of the three subsystems I identified earlier: the actor and action system; the evaluative-social indicator system and the goals-social welfare system, from the standpoint of efficiency of action and response in resolving environmental issues. Second, we need long-term research into how these three subsystems interact and "naturally evolve" once a perturbation occurs in one or more of them. Economists and others have become quite skilled in predicting institutional and behavioral response to changes in these signals. Third, we need research into the methodology of planning to discover better mechanisms of planning. As Prof. William Cooper of Michigan State University has often pointed out, the time horizon of ecologists is perhaps 100 times longer than regional planners and 1,000 times longer than economists. Yet if all three are involved jointly in land-use planning, a commonly agreed-upon time horizon is almost a necessity.[28]

Given these rather general recommendations, I will next offer a list of specific recommendations by subsystem. First, with regard to the actors and action system in land-use planning, the following types of research would be extremely valuable:

(1) *Research studies on the behavioral interdependence of public and*

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[28] One suggestion for a criterion on time horizons for land-use planning might start with the supposition that there are obvious lower and possible upper bounds on what

private actors. What are the limits of public coordination of private actions before private actors attempt to thwart illegally or neutralize public controls? What are the specific tradeoffs measured in monetary gains and losses of rigidly enforced environmental land-use controls? What are the tradeoffs between increased flexibility of controls and loss in monitoring efficiency? What kind of controls bear higher social costs because private actors perceive these controls as too oppressive, and how can we measure these costs? Under what circumstances are less-direct controls perceived as more oppressive? Under what circumstances are public actors likely to become "captives" of private interests in land-use planning and what devices or structural changes in the control agency can be used to remove this proclivity toward conclusion?

(2) *Research on what efficiency criteria should be applied to evaluative alternative types of control agencies.* Based on historical comparisons, can cost-effectiveness indices be constructed for different types of land-use agencies? Is cost minimization a sufficient criterion, or if there are other criteria how should they be weighted? In terms of environmental problems which tend not be be "discovered" until they reach harmful intensities, how important is reactive speed in resolving the problem? In addition, research needs to be conducted on development of formal criteria for defining the mandate and political-geographical jurisdiction of control agencies. In regional water planning rather ad hoc criteria have been suggested in the past, such as the basin's drainage area or where there would be a substantial impact of actions of a control agency. Such an inquiry should not focus on "ideal" jurisdictions and environmental problems or disruptions do not coincide. This suggests that the quasi-market concept for public goods theoretically developed by economists might be used as a paradigm for studying land-use and environmental quality issues with uncommon boundaries between jurisdictions and problems.

(3) *A taxonomic identification of other feasible types of land-use controls is needed.* So far, very few land-use signals other than zoning, property taxes, eminent domain, and indirect signals on land use such as building codes have been studied as to their impact on efficient land use. Another of the most important social science research tasks, in my opinion, is to discover, through theoretical models, small experiments and observation on past experiments (e.g., California's agricultural land preserve system), the impact of land-use controls on social indicators to which private actors respond and their probable responses. Such research studies are needed if we are to be able to make judgments on the relative efficiency of land-use controls and alternative types.

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future generations desire, say, in the form of flexibility in land use. The problem, of course, is to select a planning system which will allow movement within those boundaries. The planning horizon in this case might be to that point in future time where current planners are totally uncertain as to future generations' preferences within those boundaries. These may be highest at any point within the upper and lower bounds. Of course, the more information current planners have, the more probable it is that point of time of equal uncertainty is further into the future. This suggests that planning horizons will vary depending on the institutional characteristics, mandate, and funding of the control agency.

of control agencies. In conjunction with this type of research, I would also suggest that an efficiency comparison be made between agencies with relatively weak mandate, dependent on courts for sustaining their land-use policies, and agencies using penalty systems (effluent charges, easement taxes, user fees, etc.). One study has already attempted to contrast a special case of these two general types of mandates for control agencies by comparing New Mexico and Colorado State water doctrines.[29] Research questions include: Under what circumstances are traditional tools (such as zoning) better controls than less-direct controls (such as compensation systems for spillovers or organized bidding for zonal rights)? What is the relationship between localized land-use controls and regional spillovers and how should this relationship affect the choice of local controls and control agencies? To what degree must consistency by achieved for land-use signals meted out by different control agencies in the same geographic area? Of course, the original mandates of each agency should be divided partly on the basis of minimizing the amount of overlap in influencing desirable patterns of land use, but often they are not. As Thomas H. Roberts noted in his background comments, "metropolitan areas are balkanized into multiple units of local government." I might add that they each provide signals which are at least partially inconsistent from the viewpoint of economic policy.[30]

To summarize the major points of view expressed here, research studies are needed which attempt a simultaneous analysis of land-use controls with institutions that implement these controls. Historically, economic policy research has taken institutions including control agency structure and mandate and private property right doctrines as immutable and contrasted alternative economic policies of regulation within the presumed unchanging institutional structure. With rapidly accelerating and generally unpredictable environmental problems and conflicts arising in regard to land use, we need research on which structural forms of control agencies can best respond. At this time we can only vaguely identify criteria for "best response." Most economic research in the past has presumed particular behavior patterns for those affected, including speculators, land developers, and others. Investigations, however, did not determine whether such behavior actually occurred, or whether the signals derived from statutes or economic policies achieved the desired results, from a comprehensive point of view.

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[29] See L. M. Hartman and D. Seastone, *Water Transfers: Economic Efficiency and Alternative Institutions*, Resources for the Future, Inc. (Baltimore: The Johns Hopkins Press, 1968).

[30] In this regard, it is instructive to note, using Tinbergen's target-instrument approach for economy policy, that if there are M control agencies, each with a precise list of N mutually exclusive targets or objectives and N instruments to achieve them, and if there is at least a single interdependence between an agency's target or instrument and some other agency's target or instrument, for all agencies, there is no possible way for *any* agency to achieve its N targets precisely. This is due, of course, to interdependence which is likely to exist in land-use planning situations where the use of many resources are planned by a number of diverse agencies. But given the nature of land use planning, (i.e., planning bits and pieces of one resource by an amalgam of diverse agencies), it is likely that interdependencies will exist.

Chapter 8

ECOLOGICAL CONCEPTS AND APPLICATIONS TO PLANNING

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PLANNING FROM AN ECOLOGICAL PERSPECTIVE– AN OVERVIEW

Incorporating Ecological Perspectives Into Planning

The wealth of recent environmentally related scientific literature and the popular accounts of environmental problems and hazards confront us daily. They make a forceful case for incorporating ecological perspectives into the planning process and into decisions about where and how we live, work, and recreate.

There is a large knowledge gap between scientists and lay citizens concerning environmental processes, constraints, and hazards. The gap between that knowledge base and its application by planners may be equally large. The explosion in information and knowledge is one major reason. The typical planner is heavily burdened with day-to-day operational decisions and simply does not have the opportunity to keep abreast of new ecological information.

A second reason, however, is the difference between the orientation and perspective of the ecologist and that of the planners and engineers who make and implement plans for human settlements.

The ecologist, as a biologist, has been trained to accept the design of biological systems as being fixed by evolution. Therefore, his perspective has been to develop a science of protecting, repairing, and conserving the physical integrity of the system. His is a descriptive science whose primary mode of hypothesis testing has relied on spatial and temporal comparisons of a wide array of ecological systems. Today, however, considerable emphasis is being given to modeling and experimentation to explore the dynamic relationships between the design and behavioral responses of ecological systems.

The engineer, on the other hand, is trained to view a system under the constraints of a set of desired behavioral criteria and economic limitations. His perspective is one which asks what is *not* there and how can the physical design of the system be altered to achieve the desired specifications. The behavior of the individual components in the system is determined by their design specifications and the primary emphasis is directed toward researching the desirable design for any given objective from a wide array of technically feasible alternatives.

The planning professional's perspective often appears to be a blend of both the ecologist's and engineer's perspectives of design. The planner desires to fulfill a preferred array of behavioral objectives (lumped into a statement of "quality of life") by manipulating and/or regulating the physical design and functions of landscapes. The planner must deal with the technologically and architecturally possible, the economically feasible, the socially and politically acceptable, and the legally possible. Typically, the planner has not dealt with the ecological constraints or consequences that underlie what is possible from the engineering standpoint. Neither has the planner typically assessed the extent to which his plans are tied to ecosystems for resource supplies, waste management, and assimilation.

The primary purpose of this study is to describe specifically the necessary ecological inputs to planning. It covers (1) key technical relationships and realities concerning man and his ecosystems; (2) operational concepts for use by planners; (3) institutional arrangements important in the application of those concepts in planning, decisionmaking, and action.

Technical Relationships Necessary in Planning Considerations

Much has been written about ecological relationships. To the typical planner or planning practitioner, this wealth of material presents a large, confusing, and sometimes conflicting mass of information.

There are several key ecological relationships or realities that must somehow be a part of the planning perspective. Simply stated, they are as follows:

1. Man's activities are still closely tied to the natural ecological components of our earth's surface.

2. The processes that predominantly influence the development of our environment are economic, political, and social for the human sector, and evolutionary for the ecological sector.

3. The resources required to support man originated from, and are returned to, the ecological sector. These essential resources are composed of chemicals and energy.

4. Utilization of these energies and material resources generate thermal and chemical byproducts that are primarily treated as waste.

5. The ability of the ecological sector to assimilate these wastes in an acceptable fashion depends upon their nature and concentration and the biological characteristics of the environment.

6. Significant regional difference exists in acceptable assimilation capabilities, due to variations in the nature of the local environments and in the perceptions and expectations of the local sociocultural aggregations.

7. The development, management, and regulatory institutions (economic, political, etc.) designed to influence the flows and distributions of resources and wastes have not yet responded to the overall nature of ecological realities.

8. To date, the evolutionary design of the natural ecological sector represents constraints on the activities of man. There is little evidence that current technologies for short-term relief can be used to remove these constraints over the long term.

9. Increases in the size of the human population and/or the consumption patterns of individuals will increase our ecological problems as long as man's activities are highly dependent on the natural ecological sector.

10. In order to increase the quality of human life, the distribution of production and consumption activities must be compatible with ecological characteristics of the environment, as well as with social preferences. Alternatively, new technologies must be utilized to uncouple man from the natural ecological sector in order to generate increased opportunities for man's activities.

11. The harder man drives his environment by demanding higher flows of materials and energy, the more difficult and costly the effort will be to produce a stable and predictable human ecosystem.

12. An inescapable cost resulting from driving our environment at a high rate of activity and still maintain a predictable (stable) system is the loss of individual freedoms.

The first section of this paper, Planning From An Ecological Perspective—An Overview, elaborates upon the above relationships. It discusses, in deliberate detail, the ecological concepts and scientific understanding required to incorporate such relationships into the planning process.

Operational concepts of specific value to the planning practitioner are provided in the section, Operational Concepts For Use By Planning Practitioners. It presents these concepts in as simplified a form as is consistent with underlying technical realities.

Institutional Arrangements for Application

An increased sensitivity toward an ecological perspective in planning and a greater understanding of technical relationships between man and his ecosystems are vital but not sufficient.

The use or modification of existing institutions or the creation of new institutions for applying this increased understanding is also needed.

Institutional arrangements are discussed in this paper's section, Institutional Arrangements for Application. It groups institutions in functional terms and arrays them by the functions necessary if ecological realities are to be reflected pervasively in planning and action, and subsequently in human settlement patterns.

TECHNICAL RELATIONSHIPS AND REALITIES CONCERNING MAN AND ECOSYSTEMS

Component Definitions

The real world is a complex system which is poorly understood by any academic or practitioner in any discipline. To understand the world, one must conceptualize its operations by abstracting the system into a limited number of functional components. There is a wide array of abstractions required to handle the vast number of problems facing the regional planner. No single abstraction is uniquely correct; each abstraction should be chosen in light of the problem to be solved. A particular abstraction thought to be of good general use for the planning practitioner is divided into the three basic processes which appear to be necessary components of any biological system (human or nonhuman). They are the transformations of materials and energy, the transports and storages of material goods, and the controls of flow rates and distributions of materials and energy.[1]

The first two processes deal with the actual flows and distribution of materials and energy. Abstractions based on these processes reflect changes in the temporal and spatial dynamics of mass and energy. The majority of physical behaviors associated with machines, humans, and other biological entities will be included in this subset. Those behaviors which deal only with alterations in information and social perceptions and are not expressed in a material sense will be excluded by this form of system abstraction.

Transformations

The transformation process can be divided into three sectors: the geosphere, the human sector, and the natural sector, as shown in figure 8.1. Both production and consumption constitute a change or transformation of the structural state of material goods. In the human sector there exists three basic transformation processes: agricultural production, industrial production, and human consumption. Agricultural production is a basic transformation process which aggregates inorganic nutrients (nitrogen, phosphorus, potassium, etc.) and produces a flow of structured organic materials (corn, beef, cotton, etc.). The behavior of this component can be expressed in terms of the rates of material flows and the general costs (resources) of the flow rates. The behavioral characteristics of specific agricultural activities are not always apparent. It is often necessary to develop a conceptualization of the microstructure (fig. 8.2) in order to analyze or understand the dynamics of the component. This can be done at many levels for each of the components in figure 8.1.

The industrial production is a similar transformation process, but the technology of conversion is mechanical instead of biological. An automobile

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[1] Koenig, H. E., Cooper, W. E., and Falvey, J. M. (1972) "Industrialized ecosystem design and management." *Annual Report* NSF GI-20, 38 pp.

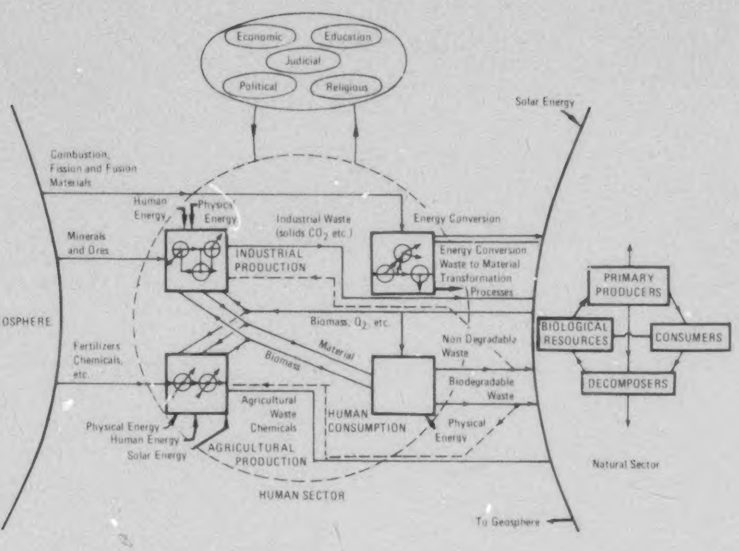
Economic
Education
Judicial
Political
Religious
Solar Energy
Combustion, Fission and Fusion Materials
Human Energy
Physical Energy
Industrial Waste (solids CO_2 etc.)
Energy Conversion
Minerals and Ores
INDUSTRIAL PRODUCTION
Energy Conversion Waste to Material Transformation Processes
PRIMARY PRODUCERS
GEOSPHERE
Biomass, O_2, etc.
BIOLOGICAL RESOURCES
CONSUMERS
Fertilizers Chemicals, etc.
Material
Biomass
Non Degradable Waste
Biodegradable Waste
DECOMPOSERS
Agricultural Waste Chemicals
HUMAN CONSUMPTION
Physical Energy
Physical Energy
Human Energy
Solar Energy
AGRICULTURAL PRODUCTION
Natural Sector
HUMAN SECTOR
To Geosphere

Figure 8.1 Macro Features of Material Transformation and Transmission Process and the Institutionalization Control Process

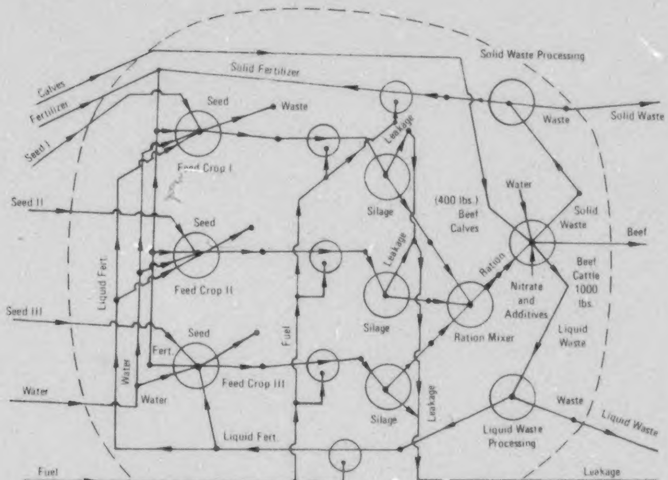
Solid Waste Processing
Solid Fertilizer
Calves
Fertilizer
Seed I
Seed
Waste
Waste
Solid Waste
Leakage
Feed Crop I
Water
Seed II
Silage
(400 lbs.) Beef Calves
Solid Waste
Beef
Seed
Leakage
Ration
Beef Cattle 1000 lbs.
Liquid Fert.
Feed Crop II
Nitrate and Additives
Seed III
Seed
Silage
Ration Mixer
Liquid Waste
Fert.
Fuel
Water
Feed Crop III
Water
Water
Silage
Leakage
Waste
Liquid Waste
Liquid Fert.
Liquid Waste Processing
Fuel
Leakage

Figure 8.2 A Functional Structure of a Typical Beef Production Process

plant requires inputs of basic chemical building blocks and assimilates these into a structural object (an automobile). The aggregate of people commonly associated with urban areas represents a concentration of consumer processes which function to reduce material structure. In this model, the waste processing is considered part of the consumption process. People require structured material flows as inputs (corn, automobiles) and produce liquid and solid waste as outputs.

A similar relationship of production and consumption is evident in the "natural" sector, in that the process of photosynthesis is the basic creative transformation in terms of generating flows of organic materials. All other organisms in the hierarchical arrangement of transformation process are consumers (degraders) either of living organisms (herbivores, predators) or dead organic materials (decomposers). The biological components in the "natural" sector are restricted to the use of solar energy during the transformation process. The "human" sector through the use of machine technologies and social behaviors can augment solar energy inputs with mechanical (calories) and human (time) energies (fig. 8.1).

Transport and Storage

The function of the transport process is to redistribute materials in space and store them in time. The importance of this process in the evolution of physical designs is often overlooked. The spatial and temporal distributions will reflect themselves as time lags in the rates of material transformations given any level of constraints. Another mode of expression is the energy cost required for the transport process to insure that a material transformation will occur with the desired frequency, given any distribution of the essential components in space.

Control Process

Feedback mechanisms exist in both the human and "natural" sectors. The function of these mechanisms is to constrain the behaviors of components or arrays of coupled components to be consistent with some selection process. Let us call this function "control." These control processes function by sensing information about the current states of the system, processing that information in relation to some defined set of criteria, and transmitting back a message that modifies the behavior in the next time period so as to converge on some desired goal. In the "natural" sector, the control function is diversified and disaggregated throughout the structure of the community. In an evolutionary game where extinction of individual populations is not uncommon, it is more secure to decentralize important processes.

These evolutionary designed feedback mechanisms exist at all levels of biological organization. Because they are diversified they are characterized by a wide array of response times. There is a balance between continuity in time, and response flexibility to external stimuli, that must be maintained at all levels of organization. A convenient ordering of control processes in terms of relative response times is as follows:

<table>
<tr><td>Level of Control Mechanism</td><td>Individual Behavior</td><td colspan="2">Population Behavior</td><td colspan="2">Population Change</td><td colspan="2">Community Change</td></tr>
<tr><td>Specific Mechanisms</td><td colspan="2">Predation</td><td>Competition</td><td>Physiological Acclamation</td><td>Genetic Adjustments</td><td>Community Succession</td><td>Biological Evolution</td></tr>
<tr><td>Relative Time Domains</td><td>Minutes</td><td colspan="2">Days</td><td colspan="2">Months</td><td colspan="2">Years</td></tr>
</table>

In the human sector, the control processes have been isolated from the transformation process and designed as a separate component. These control devices can be mechanical, as in the case of the thermostat on a refrigerator, or they can be institutionalized as economic, political, educational, religious, or judicial organizations (fig. 8.1). The process, however, is still strictly comparable to the controls discussed above, complete with sensors, feedbacks, and behavioral modifications.

In "natural" biological systems there exists a continuum of levels of organization from cells, organs, organisms, populations, and communities to ecosystems. Each level is characterized by its own set of homeostatic feedback mechanisms. Each level is responding to its own form of selection, which is attempting to insure a continuous flow of materials and energy necessary for the maintenance of the biological structure. Within each level, individual elements are often expendable (individuals within a population; populations within a community), since a large functional redundancy usually exists. The selection mechanism usually entails a genetic mechanism which operates well at the individual and population level. The mechanism of selection at the community and ecosystem level is not well understood.

Human Versus Natural Subsystems

A simplified abstraction of the mass-energy processes composing the human and the "natural" subsystems is presented in figure 8.1. The design characteristics, the selection processes, the object functions, the temporal perspectives, and the distributional features of the two subsystems are basically different. To understand the basic conflicts between the two coupled systems, one must first analyze their characteristics independently.

Goals

The goal of the human sector in our Western society is growth oriented. Our individual expectations and our institutional structures assume and often require growth. This growth is reflected predominantly in increasing flow rates of materials and energies, and less so in an increasing stock of population and material wealth. This systemic attitude requires an ever-increasing demand on the production and assimilation capabilities of the "natural" sector and a corresponding increase in the utilization of energy and the production of heat.

The goal of the "natural" sector is to survive in an evolutionary game, where the optimum strategy is to maximize the length of time one is in the game. One only loses once, since one is then a fossil. Considerable reliance is given to homeostatic feedback mechanisms and design characteristics which minimize the amplitude of fluctuations of the required maintenance flows (mass and energy) and maximizes the probability that the physical integrity of the coupled system will be preserved and passed on in time to maintain continuity. In the "natural" sector, no single component grows (increases in either standing stock and/or demand on resources) for very long. Growth by one entity invariably results in a decrease in some other. The complex array of homeostatic mechanisms generally function to constrain individual growth in this kind of closed, competitive displacement system.

The "natural" sector represents a constraint on the human sector as a function of the rates with which it can produce material goods and assimilate material and thermal wastes. The metabolic rates of this sector are fixed by evolutionary processes and are fitted to past environmental situations, not to future demands. Whether man can relax these constraints by ecological engineering is still an open question. Any synthetic ecological system that has operated at a higher rate of mass-energy transformations than "natural" communities has required a large input of materials and energy and/or degraded the system by consuming environmental capital. If these constraints cannot be relaxed by redesigning viable seminatural systems to assimilate the residuals, then the human sector must either discouple itself from its environment (this is not feasible at present) or it must reorient itself to operate within the constraints of the "natural" sector.

Time Domains

The expectations concerning the time required for the achievement of the goals is a second fundamental difference between the two sectors. In the "natural" sector the time domains are a characteristic of the homeostatic mechanisms. In the evolutionary time scale, the criteria of success require survivorship for many generations. Short-term decisions which are exclusively oriented toward the present generation will most probably prove to be suicidal.

In the human sector, the time perspective is also a characteristic of the control mechanisms. Urban planners develop 25-year master plans. Economists develop econometric models with 8- to 10-year projections. Politicians respond at 6-, 4-, or 2-year intervals depending upon their election cycles. None of the control mechanisms currently existing in the human sector, however, deal with evolutionary or ecological time domains and, therefore, are generally insensitive to the successional dynamics of ecological systems.

Spatial Dimensions

The spatial distribution of organisms, populations, and communities in the "natural" sector is characterized by a highly dispersed, low profile pattern where there are few intense aggregations of organisms and/or chemical flows. Natural systems consist of a highly mosaic pattern of biological patches (streams, lakes, fields, forests, etc.). Each patch consists of a specific array of organisms representing a distribution of functional roles corresponding to the transformation, transport, and control processes. This "patchiness" contributes to the spatial heterogeneity of the physical design and is thought to be a major factor insuring long-term stability to natural ecosystems.

The human sector is characterized by a highly aggregated distribution of machines, people, and agricultural organisms. This form of clumped distribution results from a desire to utilize resources efficiently, and an accounting system which is incomplete in its internalization of costs and biased due to an insufficient pricing mechanism. The basic problem resides in the concept of efficiency and the various forms of energy being utilized to "run" society.

Three forms of energy are currently being utilized in the human sector: solar energy which is equivalent to land or surface areas, human energy which is equivalent to time, and mechanical energy measured directly in calories (fig. 8.1). These resources are equivalent to energy and therefore are not recyclable, but rather are dealt with in some allocation procedure.

The "natural" sector runs on solar energy and the nonindustrial, labor-intensive human societies run primarily on solar and human energy. In both cases the economies of scale curves relating to size or concentration of the production and/or consumption process is basically flat. As society shifts to a technological base of material transformation and transport, the economies of scale curve shifts to indicate an increase in efficiency with increasing size. It is this pressure for economic efficiency that has partially motivated the development of industrialized agriculture, supersonic transports, massive industrial complexes, and increasing urban growth in already large metropolitan areas.

If the external diseconomies of scale are internalized (fig. 8.3*a*), a different relationship emerges between size (or aggregation) and efficiency in a general social welfare sense. The externalities can include a wide range of systemic stresses and perturbations such as eutrophication, outbreaks of pest populations, buildup of toxic chemicals in ecological food chains, social stress, and inequities in environmental opportunities for specific social or economic classes. These social and ecological external diseconomies are often nonlinear, but with a positive rather than a negative slope. The desired size and/or aggregation of our production and consumption components is indicated by the intersection of these two curves. There is no optimal size or distribution, however, since the shape of the marginal net benefit curve depends on the state of technological development and the shape of the marginal-cost curve depends partly on the perceived costs (social tradeoffs) that society associates with various levels of social and environmental quality (fig. 8.3*b*).

The difference in spatial design profiles that exist between the "natural" and human sectors is not the result of a careful analysis and planning decisions. Rather, it is the result of systemic responses to two selection processes (evolutionary versus economic), both of which reward efficiency but under different time domains and resource constraints. This difference lies at the heart of the conflict between economic growth and development versus

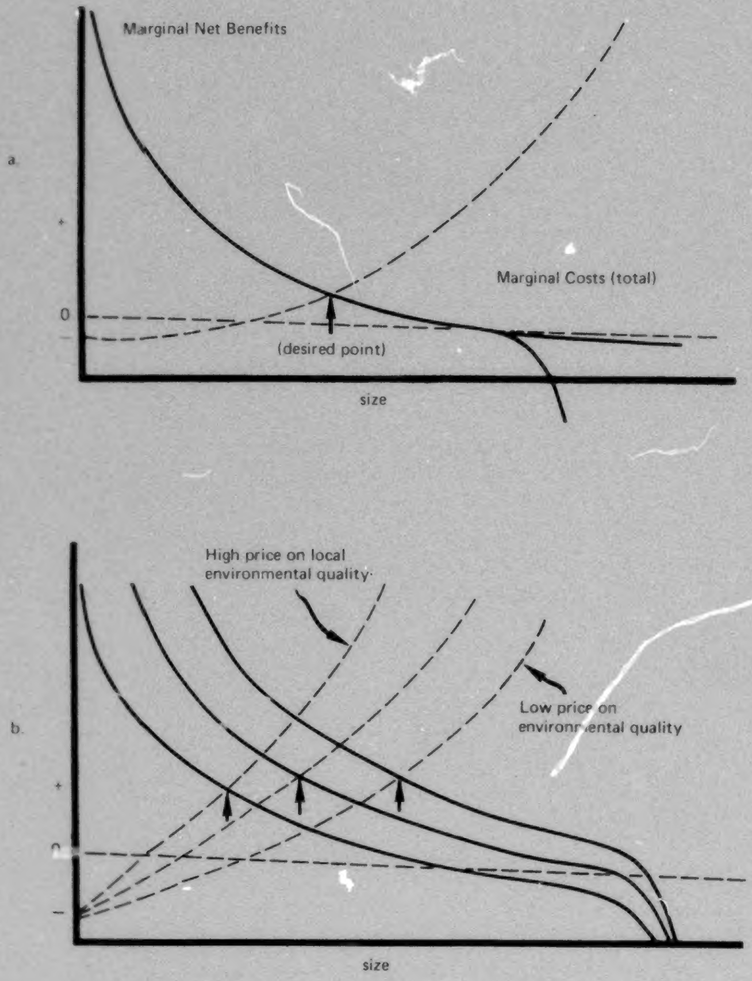

Figure 8.3 Economics of Scale Versus Social and Environmental External Diseconomies: (a) a fixed technology and a single set of social values; (b) a variety of technologies and an array of social tradeoffs

environmental quality and stability. It compounds the environmental problems associated with the sheer magnitudes of resource consumption and waste production resulting from a given population.

Stability

Ecologists relate the concept of stability to the consistency and/or predictability of systemic behaviors through time. At each level of abstraction in the hierarchy of organization, the mechanisms and expressions of these homeostatic mechanisms will vary. At the ecosystem level, the trajectory of systemic development (often called succession) is assumed to be bounded so that it converges to a common goal (climax community) for any given environment. The consistent responses of landscapes and lakes to repeated perturbations like fire, floods, glaciation, agricultural disruptions, etc., are empirical evidence of stability resulting from homeostatic mechanisms operating at this level. The assumption is that as long as the environment is not significantly altered, the pattern of ecological development will continue to repeat itself. It also indicates that any given initial state (of landscape design) will be characterized by its own internal dynamics, which will result in a predictable trajectory of future development. Planning must take into account the trajectory of maturation and the climax state of ecosystems. This will require a greater input of sound ecological knowledge into the planning process and an expansion of the time horizon.

At the community level, homeostatic mechanisms operate to maintain the temporal continuity of the structure which characterizes any given stage along the successional trajectory. This regional stability results from the compensatory responses of biological populations to changes in internal states and environmental constraints. This form of compensation provides the community with the ability to withstand considerable perturbations, providing they do not exceed the bounds of the compensatory response mechanism.

As examples, the Dutch elm fungus has virtually eliminated the American elm from many of our eastern forests. Other species have increased in abundance and have assumed the functional role in an apparently satisfactory fashion. On the other hand, the aftermath of the introductions of the sea lamprey and the alewife into the Great Lakes are examples of exceeding the boundary conditions with the resulting destruction of an existing community array. A considerable period of ecological instability will persist in these lakes until a sufficiently compatible structure is reestablished either by man or by coevolution.

At the population level, the concept of stability is synonymous with population regulation. Individual populations oscillate in space and time due to a large number of biotic and abiotic reasons. Many of the problems associated with fish and game management, pest control, epidemiology, forestry, and agricultural production are based on design and management technologies developed to control the temporal behavior of an individual population within some man-imposed boundary conditions.

Any form of landscape planning must consider the stability characteristics of the resident ecological systems. Many of the esthetic and human health properties of man's environment depend on the various levels of homeostatic mechanisms being intact and operable within the range of demands superimposed upon them.

Successional States

Odum summarizes the structural and behavioral properties of developmental stages along the trajectory of terrestrial succession.[2] Early stages represent disrupted or new environments that have little biological structure. Organisms that colonize these environments are growth and production oriented and compete through differential growth rates at the population level. These organisms are characterized by short generation times, high reproductive rates, generalized physiological and behavioral adaptations, low efficiencies of resource utilization, and high net productivity. The community composed of these populations with high turnover rates is characterized by open nutrient cycles, low biological and structural diversity, low stability, major emphasis on primary production (green plants), and a relatively short life expectancy without repeated external perturbations.

The endpoint of a successional trajectory is a community characterized by high biological and structural diversity, high efficiencies of resource utilization, closed chemical cycles, low net productivity, predominance of detritus processing, and a high level of stability. The populations composing the community are characterized by long generation times, low reproduction, specialized physiological and behavioral tolerances (narrow ecological niche), and relatively slow rates of population responses to perturbation. These communities are oriented, through selection pressures, toward stability and integration rather than growth and production. It is interesting to note that rather than adapting given populations to the two extreme modes of selection (growth versus integration) in biological succession, whole new arrays of populations appear in later stages. One could argue that in societal succession, institutional species must either adapt (evolve) to the shift from an early pioneering community (growth oriented) to a more stable, climax community or be replaced by more compatible institutional species. We might well have to have some social displacements in the same way that natural communities undergo a succession of biological displacements.

The early successional stage describes our modern form of industrialized, monospecific agriculture which is one of the more costly, inherently unstable forms of ecological landscapes that have been designed. Information is emerging that indicates our modern agricultural landscapes are often operating at a net loss in energy (calories). This is especially disturbing, since this component supposedly represents the energy fixation process which is responsible for a net gain in available energy. The labor-intensive, culturally based agricultural practices of many of the developing countries are characterized by net gains in energy. Perelman, for instance, reports a 53:1 gain in available energy with wet-rice agriculture in China and a 20:1 loss in our mechanized wet-rice agriculture in Arkansas.[3]

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[2] Odum, E. P. (1969) "The Strategy of Ecosystem Development." *Science* 164:262-270.

[3] Perelman, Michael (1972) "Efficiency in Agriculture," Chico State College, Department of Economics (mimeo).

The basic ecological problem lies in the physical design and stability characteristics of our modern agricultural landscapes. Natural landscapes develop a relative complex diversity both biologically and spatially. This complexity provides the structure to internalize and decentralize the control or homeostatic processes. Perturbations imposed on a single element (Dutch elm fungus on American elm trees) are dampened as the impact of the event spreads out through the community. With each transformation of organic material (insects into birds), about 80 percent of the energy is lost either as maintenance (respiration) or waste materials. Almost all of the energy fixed by green plants is utilized to maintain the diverse biological structure required to provide this form of decentralized community design. In other words, the "natural" sector was not designed to support modern human society. To the degree that our population and individual material expectations increase, man will have to continue to alter the design of natural landscapes. This does not, however, mean that any design will be compatible with the constraints imposed on man by the remaining natural sector.

Modern agricultural techniques are geared to destroy the natural diversity and to maintain a genetic monoculture in large blocks of landscape. The analysis of such a design must not ignore the control process (as is most commonly done), but rather must internalize the environmental costs of tractors, herbicides, fertilizers, insecticides, and fossil fuel inputs required to maintain stability of the synthetic system (fig. 8.4). If an efficiency analysis is performed at the systemic level, one finds that many of our modern agricultural practices are merely transforming calories of fossil fuels into those of food, with a net loss in calories. The crucial costs are those associated with the maintenance requirements of these simplified landscapes.

Natural Constraints

At any given stage along the successional trajectory, the community has the capability of producing a certain output flow of organic products and assimilating a certain input flow of waste products. These processes can take place without disruption to the integrity of the community, providing the boundary conditions are not exceeded. The magnitude of these transformation capabilities depends on the environmental conditions and the stage of ecosystem development. Environments that are warm and humid have greater processing capabilities than those that are cold or dry. Early successional stages have a much higher processing capability than do climax communities.

The distribution of these ecological capabilities is as diversified and heterogeneous as are the various ecological systems themselves. Planning and regulatory policies should not be based on the assumption of equality when dealing with ecological resources. Uniform regulations on chemical discharges, land use, recreational developments, taxation schemes, etc., all ignore the unique local potentials of ecological systems to provide production and assimilation capabilities for human society. The potential of each local environment should be considered, utilized, and protected as an important and unique asset to human society.

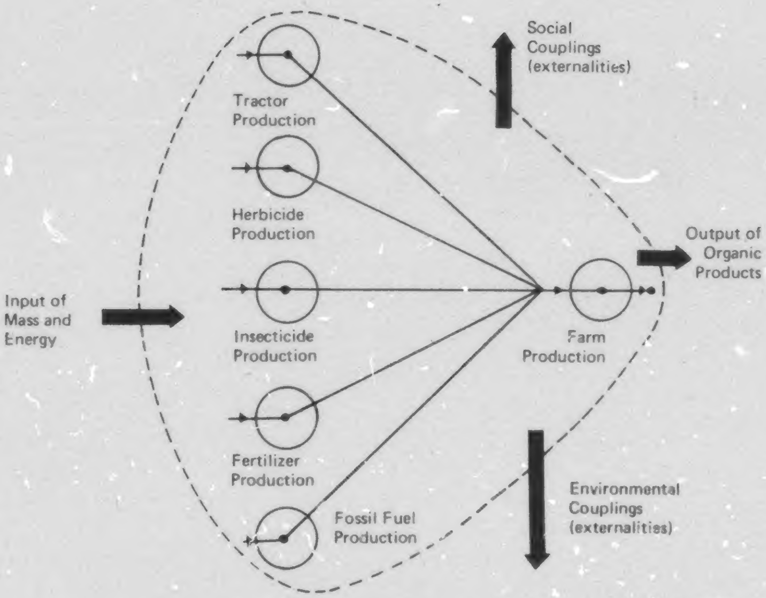
Social
Couplings
(externalities)
Tractor
Production
Herbicide
Production
Output of
Organic
Products
Input of
Mass and
Energy
Insecticide
Production
Farm
Production
Fertilizer
Production
Environmental
Couplings
(externalities)
Fossil Fuel
Production

Figure 8.4 System Abstraction of a Functional Unit Characterizing Our Modern Industrialized Agriculture

A basic problem exists in recognizing and quantifying the magnitude of the ecological resource, and identifying what proportion of the potential is actually committed to the baseline demands imposed on these ecological systems by their nonhuman environments. The range of processing rates that are tolerable (that is, that do not represent a significant perturbation) is a function of the range of environmental conditions experienced over a finite period of history (fig. 8.5). The "safe" level of human augmentation will depend on the magnitude of the natural demand being experienced at any point in time. The range of assimilation and production capabilities appears to be greater in early successional stages and in more harsh (fluctuating) environments.

A management scheme designed to assay the acceptable level of production and assimilation that can be expected from any unit of a given ecological system will depend upon a continual environmental sensing system. The level and precision of data during periods where the system is operating near the center of the region of stability can be fairly crude. As the system approaches the boundary conditions, much more precise information will be needed to redirect the future trajectory away from the boundary conditions. These systems of on-line data acquisition, analysis, and interpretation have not yet been developed and there is considerable uncertainty about the absolute nature of the production and assimilation capacities of most ecological systems.

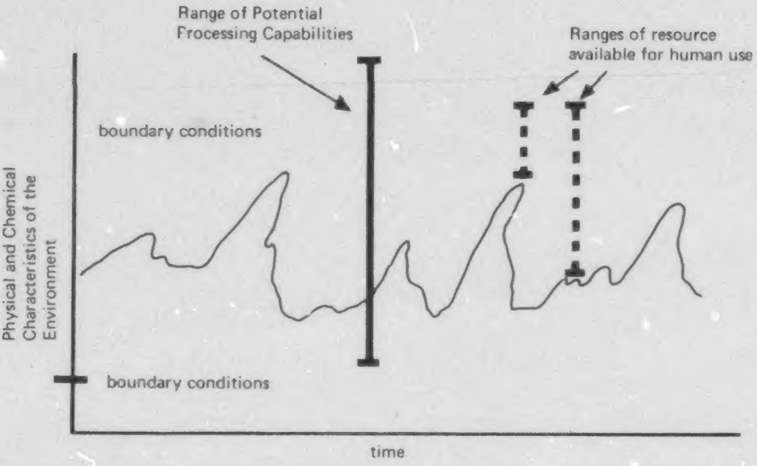
Range of Potential Processing Capabilities
Ranges of resource available for human use
boundary conditions
Physical and Chemical Characteristics of the Environment
boundary conditions
time

Figure 8.5 The Range of Potential Processing Capability of A Given Community Versus The Unused Assimulation Capacity Available For Human Use

Processing Capabilities

An example of the type of analysis needed for a logical identification and allocation procedure for an ecological resource is provided by examining the assimilation capabilities for waste products. The graph in figure 8.6 is used to illustrate the types of information needed. The vertical axis measures processing capabilities and is used to record two levels: (1) potential processing capability and (2) the amount of processing capability being utilized.

The potential processing capability is that level which lies within the constraints required to maintain regional stability, given any particular stage of succession. The major environmental constraints are temperature and humidity, given that the inputs (discharges from the human sector) are compatible with the processing structure of the recipient community. Stream, soil, and salt marsh systems are designed to process particulate organic materials. These systems do not respond well to inorganic inputs. Open water aquatic communities and many terrestrial systems are designed to assimilate small soluble organics and inorganic materials. Both the potential and the utilized processing capabilities are recorded for each of several classes of transformation processes that are required of the natural system (indicated on the horizontal axis). Natural organic and inorganic compounds that are not toxic are usually stimulants to the biological system. The basic problem is one of distribution to prevent overloading, which results in destruction of the structural integrity of the biological community. Natural inorganics like heavy metals, synthetic compounds that are toxic (PCB's, nondegradable pesticides, etc.), and radioactive materials are often assimilated, but result in organic products that

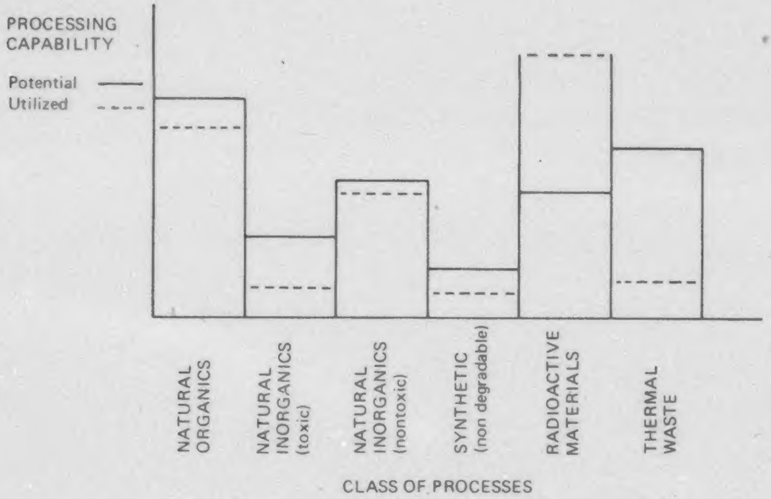

Figure 8.6 The Relationship Between Ecological Potential, Societal Needs and Social Tradeoffs

have toxic characteristics to other biological organisms. The accumulation of these materials in the ecological system is a major threat to the esthetic and human health characteristics of our environment. Distribution (dilution in space) cannot be considered a feasible solution to the waste disposal problems with these materials. Thermal effluents are dissipated through the atmosphere and constitute problems to the degree to which temperature profiles and hydrological flows are altered in localized areas.

The degree to which the potential processing capability is utilized indicates the social tradeoffs between the layman's concept of environmental quality and the extent to which human society desires or needs to utilize the production and assimilation capabilities of the natural environment. Lake Superior is a deep, cold, clear, oligotrophic (low production) lake which is considered "high quality" by environmental quality standards. It processes little materials either in fish production or in waste assimilation. Lake Erie is a shallow, warm, murky, eutrophic (high production) lake which functions as a tertiary treatment plant for 17 million people. It is considered "low quality," but currently has one of the highest plant and animal production per unit area of any of the Great Lakes. There is an inverse relationship between the degree to which man utilizes a resource and the level of environmental quality perceived by the general public.

Environmental "degradation" or "pollution" is in the eye of the beholder. If one wants and gets a trout stream, the stream is not "polluted." If one wants and gets a carp stream, the stream is not "polluted." However, if one wants a trout stream and is forced to accept a carp stream, then the environment is "degraded" and the stream is considered "polluted." Biologically, a carp stream can be managed as a viable biological system, if that is the desired goal.

The basic problem stems from the lack of any mechanism to enable a local region to converge on a single set of tradeoffs between resource utilization and environmental quality. The tradeoffs can be modified by alternative technologies and allocations of other resources (money and energy) but the same basic problem exists. The Great Lakes could be used as a source of drinking water, irrigation water, and cooling water, or for recreation activities or transportation. Depending on the mix desired, a different scheme of design and management would be required.

These decisions could and probably should be made at the local level. The smallest unit of ecological planning is defined by the spatial boundaries of the problem sets (airsheds, watersheds, ecological habitats, aquifers, etc.). Unfortunately, the boundaries of the ecological systems and those of the policy spaces are not contiguous. Furthermore, regional decisions are not compatible with political and economic equitability of all regions within our country. The social object functions and environmental constraints vary tremendously from locality to locality and the planning and regulatory processes must incorporate this property of multiplicity.

Design by Planning Versus Economic Signals

In a true engineering sense, each component of the system is designed to behave within specified criteria, when constrained by the other components, and over a range of external stimuli experiences resulting from its environment. The design analysis should include general equilibrium conditions and the dynamics resulting from systemic succession. The design will help to insure a well-behaved relationship between stimulus and response. An important consideration is the stimulus/response relationship between planning and the economic system.

The regional constraints imposed by the ecological characteristics of any given region should be very influential in determining the density and distribution of people, industries, and agriculture, the desired size and distribution of transportation and utility services and the location and turnover rate of housing accommodations; in short, the physical design of our society. Planning should not serve a passive function of responding to needs, but rather should utilize design tools to generate a socially acceptable system which is also ecologically viable.

The procedure, which appears to be dominant today, is for the system to respond to economic signals which serve to motivate and/or inhibit individual and institutional behavior. The resulting physical design depends, therefore, on the social validity of the signals and the sufficiency of the information. Little attention has been spent on analyzing the relationship between various arrays of economic signals, degrees of internalization of social and ecological costs, and the resulting physical landscape designs. The problems resulting from the underpricing of the transportation of people and materials by setting low prices on petroleum and externalizing many social and ecological costs of our highway network are becoming more obvious. If these inequities and omissions are eventually corrected, the design of our society would probably revert to a more heterogeneous and dispersed pattern which is more ecologically compatible in its distribution.

It is extremely difficult to envision the development of sufficient and relevant economic signals to insure the development of an environmentally stable and socially equitable society. The concepts and technologies either have not been developed or are not utilizable in our current society. The trend is to rely on the development of a logical science for regional planning.

Regional Planning

To incorporate ecologically sound concepts into the planning process, the temporal and spatial dimensions of the policy space must be compatible with those of the ecological processes. Relevant time domains must include both population and community response times. In areas like southern Florida (hot and humid), these response times are relatively rapid. In desert (dry) or arctic (cold) habitats, the response times are much longer. The relevant spatial domain depend entirely on the specific set of problems and habitats under consideration. In general, the spatial patterns of the hydrological cycle will define the boundaries of the ecological space, since water is the universal solvent and primary transport mechanism for most biologically active chemicals.

Regional decisions will allow a more complete but safe use of our environmental resources, providing a sufficient system exists for resolving conflicts between benefits and risks. Conflicts will arise between the "optimal" decision for the individual and that for the general welfare of the public. Environmental resources constitute an essentially fixed stock of goods, yet the demand is continuing to increase. The availability and/or allocation of these resources must be given serious consideration.

The relationship between mass and energy flows and standing stock of material goods is an institutional conflict. To maximize the material quality of life for most people and to minimize the demand on resources and the environmental degradation, the maintenance flows per unit stock should be minimized. This requires utilizing our technologies to maximize the durability of material goods. This strategy appears in conflict with an institutionalized reward system that is based on increasing flows of materials and energy.

Conflict will also exist between social and economic classes of people as a function of their existing life styles, their expectations of future conditions, and their individual awareness and feelings for the natural environment. Certain attitudes and expectations must be constrained for the sake of environmental quality and stability. The social mechanisms for doing this in an equitable and permanent fashion do not exist.

The necessary form of conflict resolution and mechanisms needed to converge on a technically feasible, environmentally safe, economically viable, politically manageable, and socially acceptable design of our society requires a planning process with a strong emphasis on regional, public participation. Our society is characterized by a multiplicity of values, expectations, and consumption behaviors. There is no single goal which is commonly accepted and, therefore, there is no optimal design or plan for our environment. The basic problem lies in the difference between a specific design or plan and the perception of the structure by various individuals and institutions. An intelligent strategy is to give maximum emphasis to flexibility, which means avoiding programs which commit society to irreversible changes of the social and natural environment. The concept of stewardship in contrast to ownership of our natural resources has been given lipservice but never operationalized in this country. The conflict between the needs of present and future generations of all organisms and the right of those humans currently involved with today's society must be resolved through a fundamental change in the attitudes and behaviors of our society.

OPERATIONAL CONCEPTS FOR USE BY PLANNING PRACTITIONERS

Ecological Potentials

Ecologically different regions vary in their ability to provide human society with production and assimilation capabilities. Warm and humid regions usually have the greatest biological potential, as growth is varied and rapid. Cold and/or dry regions have the least. Nontoxic and/or biodegradable materials (both organic and inorganic) can be safely processed by natural ecological systems, providing the intensity of the input does not exceed the processing potential. Long-lived toxic and/or nonbiodegradable substances (heavy metals, nondegradable pesticides, radioactive materials) cannot be safely assimilated by natural ecological systems.

An inverse relationship usually exists between the esthetic quality of the ecological resource and the intensity with which man utilizes its production and assimilation capabilities. Compare the production and esthetic quality of a cornfield with that of an alpine meadow. Similarly, compare the waste-processing performance and fish production of Lake Erie with that of Lake Superior. Lake Erie is highly polluted and highly productive with few esthetic qualities. Lake Superior, on the other hand, is a pristine, high-quality lake with low productivity and low waste-processing capability.

Waste Treatment and Disposal

Matter is not destroyed during the production or the consumption of goods. Materials that flow into a human settlement eventually must flow out. The outflow is usually considered as waste and, therefore, destined for disposal. Waste is not destroyed by merely discharging it into the environment. Material discharges must be designed and distributed in a manner compatible with the recipient ecological system. Our problems with mercury pollution of Lake St. Clair, the contamination of the world ecosystem with DDT and PCB's, and the continuing eutrophication of lakes and streams all reflect a lack of sensitivity to system capability.

Locally aquatic environments are easily overloaded with waste chemical inputs. Land-surface disposal is now receiving attention. Much detailed knowledge must be obtained concerning soil permeability, phosphorus loading capacity, water saturation relative to vegetative growth, contamination of ground waters, and the accumulation of heavy metals and toxic nondegradable synthetics in ecological food chains, before land disposal should be used widely.

Atmospheric discharges through incineration merely redistribute the chemicals as a function of the prevailing weather conditions. Discharged materials eventually enter ecological systems downwind. Solid waste is commonly buried where, hopefully, there is little leakage to ground waters. Until society learns to consider material wastes as resources, there will be no long-term solution to waste disposal. Stable natural ecosystems are usually characterized by closed chemical cycles. In the long run this must be true for human systems. It would be wise to stockpile waste materials and not disperse them in low concentrations. When the need and technologies for recycling develop on a large scale, the economies of scale associated with processing large amounts of concentrated materials will be of significant benefit.

Concentration of Human Activities

Just as with other animals, man extracts an inescapable maintenance cost (flow of materials and energy) to support his existence and activities. These flows result in predictable discharges released into the natural environment, the density and distribution of the human population determines the degree to which the ecological environment is overloaded and degraded. As State and Federal legislation and environmental quality standards become more rigorous as a result of citizen concern, pressure will grow to influence the local density and distribution of people. Increasingly it will be difficult for individuals to live where and how they please.

Where the technologies exist for operating production and waste processing as closed chemical systems (complete recycling), there are usually advantages in concentrating these activities into large individual operating units. The economies of scale in both moneys and energy may make large operating units desirable.

Energy Production

The limited amount of easily extracted fossil fuels remaining and our increasing demand for energy appears to be stimulating a national shift from direct use of fossil fuels to electrical energies. This shift will require a very sophisticated technology and will significantly affect the evaluation of land-use patterns. In particular, the costs of transporting materials and man will come under question. We have underpriced the cost of the energy and facilities required to move materials and people. This has encouraged greater aggregation of people, industrial, and agricultural activities. It is easy to conceive of the shift from organic fuels to electrical energy for fixed facilities (lights, air conditioners, etc.), but the technology to do this for our transportation process does not exist.

Ecological Irreversibility

Our knowledge of ecological systems is not sufficient to be sure that today's good decisions will not be evaluated as bad at some later date. Therefore, planners must minimize the decisions that may result in irreversible environmental changes. Several classes of changes are functionally irreversible in our societal timespan.

1. *Extinction* of a species of organism is an irreversible change. Eradication is a planned effort to force the extinction of a species which is an irreversible act. If we find out that we need the genetic information for some other reason, we have no way of retrieving it. Hence, eradication of any species is a dangerous concept and must be discouraged as a means of environmental management. This applies to so-called pest organisms, as well as to others.

2. *Introduction* of plants and animals from one region to another is often an irreversible act. The impact of the sea lamprey and alewife in the Great Lakes, the Japanese beetle on the east coast, and quackgrass and dandelion throughout North America illustrate the problems associated with such introductions.

3. *Local or global contamination* of the physical and biological environment with nondegradable chemicals constitutes an irreversible environmental alteration. There is no technology to scrub our environment clean of contaminants.

4. *Physical degradation* of critical areas, caused by the dredging of waterways, damming of stream channels, filling of marshes and estuaries, the erosion of organic top soils, etc., is an essentially irreversible alteration of the ecological environment. Associated with each instance of degradation is a whole family of environmental costs and ecological risks to which the planner must become sensitive.

5. *Depletion of concentrated resources,* by distributing our waste products widely over the landscape, is an irreversible change. The enormous quantities of energy required to reclaim these materials from the Gulf of Mexico, Lake Erie, the coastal ocean areas, or the many small sanitary landfills makes reconcentration highly unfeasible. This is especially true of that very critical chemical, phosphorus.

6. *Committed use* of critical environmental resources, involving large amounts of capital, causes an essentially irreversible change in the socioeconomic sense. Good agricultural soils that now are covered by a high-cost shopping center, valuable deposits of sand and gravel that lie under an airport, or estuarian and bay areas that have been filled and developed for housing are not likely to be available for other, possibly more desirable, uses.

Areas of Critical Environmental Concern

1. *Fragile environments.*–Landscapes contain groupings of organisms (animals, plants, microbes), which are integrated arrays designated as biological communities. Many of these communities represent biologic resources that can provide man with recreational, esthetic, food production, and waste assimilation opportunities. Land with well-developed organic soils, vegetation with high growth rates, and animals with broad physiological and behavioral tolerances are ecologically tough and can absorb considerable human use. In contrast, other situations are extremely fragile and human use or development will invariably lead to environmental degradation. In fragile landscapes, for example, the arctic and alpine tundra, sand dunes and deserts, the intensity and distribution of human utilization must be responsive to the ecological limitations.

2. *Inland lakes, rivers and streams.*–Recreation in our society is heavily water oriented. The available shoreline of freshwater lakes and streams represents a fixed stock of resources now under rapidly increasing demand resulting from our affluence and mobility. Our lakes, however, are chemical sinks for the total discharge of waste emanating from the surrounding watersheds. The intensity and type of land use on those lands within the watershed of the lake are primarily responsible for lake quality. If a land-use plan that will protect the integrity of the lake as a quality resource is to be developed, much information is needed on domestic and storm-water discharge, herbicide and pesticide inputs from riparian owners, public and private recreational activities, morphology and biology of each specific lake, dredging and filling of shoreline areas, and surrounding industrial, agricultural, and forestry activities.

3. *Salt marshes and estuaries.*–The shallow, marshy areas of our marine coastal zones are highly productive and perform many critical functions. Plant material flows out from the marsh and feeds many of our coastal shrimp, shellfish, and marine fishes with considerable economic input. The marshes are critical spawning areas for many important marine organisms. The water sloshes back and forth and does not mix rapidly with the offshore waters, and waste products dumped into these areas do not disperse rapidly.

These shoreline marshes have great ecological value and should not be filled, diked, or developed for housing or commercial purposes. The value of these wetlands is not easily translated into dollar-based cost accounting, but the long-term ecological and economic risks of their destruction are not trivial.

4. *Hydrologic systems (in general).*–Both human and natural ecological systems depend upon water. Landscapes must be designed and managed to maintain the hydrological balance involving water flow and distribution. Ground-water aquifers, a major source of drinking water and of stream origins, are maintained by precipitation percolating through surface and subsurface soils. Blocking this process by channelization, construction of roads, parking lots, buildings, etc., diverts water in significant quantities to surface discharge as storm-water flow. The quantity and quality (sediment and chemical

pollution) of these surface flows often alters the ecology of the recipient watercourses. Flood plains and lowlands may be important sources of aquifer recharge and deserve protection for this purpose alone. Large-scale redistribution of water by drainage, ditching and/or irrigation can influence environmental conditions severely, particularly in semiarid regions.

Biological Management

Biologic communities have evolved mechanisms to regulate the behavior of their species, populations, and component individuals. These mechanisms include predation, competition, parasitism, territoriality, and many others. Biological communities synthesized by man (rose gardens, lawns, fish ponds, agricultural plots, etc.) seldom contain a sufficient or suitable mix of organisms to insure the necessary internal regulation. Man must, therefore, provide the required maintenance using chemical controls (fertilizers, insecticides, herbicides). The magnitude of this maintenance responsibility is apparent from the size of the agrochemical industry.

The large amounts of fertilizers and pesticides leaving metropolitan areas through domestic and storm-water discharges are added evidence. Relatively natural landscapes (ecological green belts) can provide many esthetic and recreational opportunities without the enormous maintenance costs. Planners must develop a better understanding of unit diversity and scale necessary to maintain stable plant and animal populations within and outside of metropolitan areas.

Integrated Landscapes

Prudent and effective land use is sensitive to the heterogeneity of local environments. If this diversity of opportunity is utilized, a mosaic pattern of integrated land use will evolve to include agriculture, recreation, ecological greenbelts, storm-water impoundments, waste recycling (spray irrigation) with the more intensive developments. The size and location of these varied activities should reflect environmental and ecological limitations in addition to the traditional socioeconomic considerations. The advisability of less-intensive development is increased when one realizes the integrative potential to these functions. Storm-water impoundments help to stabilize the hydrologic cycle, can be developed as part of the recreation and/or ecological greenbelt area, can be used for irrigation for truck farming and will augment the esthetic nature of a metropolitan area. There are many similar combinations that can be easily developed as an integrated land-use plan.

Environmental Costs and Benefits

We have a strong tendency to evaluate land use in terms of economic cost-benefit accounting. The long- and short-term costs and risks of environmental degradation cannot be expressed in monetary terms. There is no existing pricing mechanism to assign values (dollar units) to units of environmental or ecological change. The incorporation of ecological sensitivity into the planning and decisionmaking processes will be a noneconomic process. This does not diminish the urgent need for internalizing these ecological costs and risks.

Ecological Space Versus Policy Space

The nature of a specific ecological concern will determine the size of the region involved in related planning or policy decision. Airsheds, watersheds, aquifers, and ecological land areas appear in a great number of geometric shapes and sizes. Very seldom do the boundaries of these ecological spaces coincide with the boundaries of any local decisionmaking unit. Environmental issues whose effects can be confined within a single political unit (solid-waste disposal, greenbelts, etc.) can often be handled at the local level. Environmental problems extending over large areas (atmospheric contamination, pollution of a large river, conversion of agricultural land to suburb or stripmining) must be addressed by an equally broad unit of government.

INSTITUTIONAL ARRANGEMENTS FOR APPLICATION

The technical relationships and functional concepts of ecology are of little value to the planner unless there is application. Only through application can those relationships and concepts effectively improve planning and the resultant human settlement patterns.

Institutional arrangements provide the actual or potential basis for such applications. They are the formal or informal mechanisms within which groups take action. They constitute the "rules of the game" by which individual or group actions are guided, facilitated, or constrained.

It is truly an understatement to point out that there are many institutions that could increase ecological sensitivity of individuals and groups. There are, in fact, myriads of such institutions. They range from the Federal to the local level. They serve groups from exclusively public to exclusively private, with an array of combinations in between. They span resource use situations that range from single purpose to multiple purpose. And they encompass narrow physical resource concerns to the broadest sociocultural concerns relevant to human settlement and human well-being. The conceptualizing and categorizing of institutions in relation to their actual or potential ecological role is no small task.

We are providing here one functional classification of institutions that appears helpful for research related to improved human settlement. They can be classified as those that–

1. Help identify the environmental limits and tolerances of geographic areas;
2. Develop and redevelop property in those geographic areas;

3. Provide the infrastructure on which property development, redevelopment, and resulting human settlement patterns are based;
4. Provide land-use planning and general-purpose or comprehensive planning;
5. Have or should have authority to exert environmental controls or provide environmental incentives;
6. Have or should have authority to exert controls or provide incentives for guidance of development and redevelopment and for regulation of infrastructure within the environmental constraints; and
7. Have or should have analytical, educational, informational, and demonstration roles concerning existing and possible future human settlement patterns and their consequences.

In the following pages we will indicate some of the institutions within each of these functional categories. Also, we will highlight some of the issues we consider important to the embodiment of ecological considerations in planning, action, and resultant human settlement.

Institutions to Identify Environmental Limits and Tolerances

A first and fundamental group of institutions are those that would help identify environmental limits and tolerances. Included in this group are such institutional units as the Federal Environmental Protection Agency, the Council on Environmental Quality, other Federal natural resource departments or agencies; State counterparts of EPA, CEQ, and other natural resource departments or agencies; a number of local agencies and authorities, and certain public and private research units.

Limit setting takes place at many different levels via standards that are imposed. We are accustomed to Federal and State standards and some substate and municipal standards for water and air quality. We are also accustomed to standards imposed through building, subdivision, and zoning regulations. We are becoming accustomed also to standards that emanate from legal disputes and resulting judicial determinations.

As a society, we have found it necessary to set limits, via standards, even though we have been unsure of the tolerances of the geographic areas we were trying to protect. Typically, we have not known the tolerances of various geographic areas from an ecological perspective, whether in the short run or long run. We have come much closer to understanding what is economically and socially acceptable than what is ecologically acceptable. But, even in these areas, our concerns have focused on a fairly short timespan. We have not worried about a serious crumbling of the ecological stage on which our economic and social transformation and transactions take place.

Several issues arise as we survey this group of institutions. One is how to achieve an increased sensitivity about and consideration of those transformations and transactions that are ecologically acceptable as well as economically and socially acceptable. There are very few institutions that are evaluating tolerances from these combined perspectives.

A second issue is how to permit local groups to exercise a wider range of choices. We recognize the need for some minimal standards at the national and State level that are ecologically sound. But, we also recognize the need for local communities to be able to set more rigorous standards to meet additional goals or objectives they prize. Facilitating the orderly creation of more rigorous local standards by communities who wish a more pristine environment is an important issue.

These institutions must address also the procedures and techniques for an orderly use of the varying tolerances of different geographic areas, a third major issue. Areas differ in their assimilative capacities and their fragility. To date, our institutions have not been able adequately to identify and contrast such differences in tolerance. Neither have the institutions been able to foster deliberate human settlement differences so that society would match the economic and social activities with the widely differing ecological bases on which these activities occur.

There are many other issues. One crucial issue is how institutions reassess previously established standards to insure they are indeed the logical ones, over time, from an ecological perspective. One example is the standard set for control of large-particle air pollutants. Only now is it becoming apparent that some of the procedures used to meet standards for large-particle pollutants were in fact increasing small-particle pollution for which standards were less advanced.

Property Development and Redevelopment Institutions

Included in this group is a wide array of public, quasi-public, and private agencies, groups, corporations, and individuals that directly influence human settlement and use. There are Federal agencies such as Bureau of Outdoor Recreation, Economic Development Administration, Federal Housing Authority, Public Housing Authority, Small Business Administration, Urban Renewal Administration, Corps of Engineers, Bureau of Reclamation, Forest Service, Soil Conservation Service, and other selected USDA agencies; State and multistate agencies and commissions as well as substate and local agencies and units. Included are banks, savings and loan institutions, and all manner of development authorities, agencies, groups, and corporations. The grouping is a large and varied one.

Unlike the first group mentioned, which comprised nearly all public-sector units, this group of institutions has a wide array of private-sector units. Further, these units are powerful both financially and politically.

The range of important issues here is broad. One key issue, if not the overriding issue, is how to achieve an integration of economic decisionmaking and environmental improvement decisionmaking. Historically, the public, quasi-public, and private units concerned about economic development and economic development decisions have not been in direct and continuous communication with counterpart units concerned with environmental improvement or maintenance. Research and observations conducted by our colleagues and others show convincingly that some major environmental problems can be avoided if economic development plans and environmental improvement plans can be developed at the same table. The deliberate integration of such planning at the Federal, multistate, State, substate, and local level constitutes one of our greatest challenges.

A second key issue is achieving a scale of planning that can handle many of the external effects of current public and private developments. Where external effects have major ecological significance—either for resource supply or for waste assimilation—the scale of planning should attempt to accommodate those externalities.

A review of planning efforts shows that instances are common in which we are not planning at a sufficient scale to encompass ecological side effects of municipal or metropolitan action. The solution to this scale problem, however, will not be easy. There will be conflicts at different levels as one approaches larger and larger planning scales. The problems of extraterritorial controls and home rule will surely arise. There is the added challenge of permitting and encouraging local preferences (including neighborhood preferences) to be reflected in the larger scale planning efforts.

A third issue is how to handle historic disequities in development. Some areas have grown rapidly in population and others have not. Some communities wish to curtail population growth and others want just the opposite. Some communities and regions have been very exploitive of their ecological base and others have not. Each of these conditions point to possible public policies that deliberately favor one area over another.

Simultaneously, we are concerned with uniformity of opportunity for all citizens. One of the great institutional challenges will be how to accommodate uniformity of opportunity for individuals with the need to treat dissimilar ecological areas in different ways.

Institutions Providing Infrastructure

Another important group of institutions provide the infrastructure on which property development, redevelopment, and resulting human settlement patterns are based. Included in this group is an array of public, quasi-public, and private units. They provide facilities and services for transit and transport; water supplies; waste management and treatment; electricity, gas, and other energy sources; elementary, secondary, and vocational education; recreation; hospital and health care; police and fire protection; and other governmental and private services that help comprise the infrastructure.

While Federal agencies provide an array of financial and technical assistances, it is the State, substate, and local units that have the major decisionmaking role regarding creation and location of infrastructure. Here one sees responsibility for infrastructure creation and location spread among governmental departments, special-purpose and multipurpose districts, municipal units, authorities, quasi-public corporations, private utility companies, and various public and private associations. Private financial institutions, as well as State and local governmental units, play a major role in funding infrastructure creation.

There are several issues pertaining to this group of institutional units. One of the issues is how to integrate decisions about infrastructure development with other decisions about development and redevelopment. One need only reflect on the impacts that high-speed arterial highways, freeways, and interstate routes have had on the shape and development of urban regions. More than one planning official has indicated that the design of highways probably has had more impact on development and settlement patterns in urban regions than all other urban planning efforts combined.

We have lessons from the immediate past that should not be overlooked. For example, we have observed positive benefits to central-city redevelopment from integrating decisions about urban renewal with decisions about housing, location of downtown arterials and expressways, and municipal parking facilities. Similar efforts and arrangements could be explored for a wider range of decisions and a larger geographic area or region.

A second important issue, a subset of the first, is how to achieve more complementarity or reinforcing relations among the various decisions pertaining to infrastructure development. For example, on a local scale, decisions about highway and street development, sewer and water development, electrical and other energy service extensions, school locations, parks and playground locations, open space reservation and other natural resource management decisions surely could be more closely integrated. On a regional and State scale, decisions about highway location and design, park and recreation area development and preservation, major utility locations, major industrial park and area expansions could also be more closely integrated.

A third issue is how to integrate infrastructure planning and decisionmaking and other key aspects of environmental planning and decisionmaking. If more infrastructure developments or redevelopments were planned together, it would be easier to bring to such planning appropriate and applicable environmental concerns. For example, we have heard of discussions and proposals for utility corridors to provide more efficiently the range of utility services needed for urban developments. Likewise, we have heard of discussions and proposals for environmental corridors, to reserve, preserve, and carefully manage areas possessing major environmental attributes. The discussions and plans for each might be brought together for the benefit of all. It will not be easy. The nature of the public and private planning and decisionmaking that is possible, the required scale of such planning, the necessary organizational structure and procedures, and the required array of inducements and constraints will constitute major challenges.

In the process we should be able to upgrade the performance of some of our current mechanisms. For example, it is likely that the current permit system could be materially improved and rendered more effective in fostering developments sensitive to ecological conditions.

Two other issues should be mentioned in this brief treatment. One is how to make short-run infrastructure decisions consistent with longer run environmental concerns. The other is the sharing of responsibility and remedial costs between public and private units from adverse impacts on the environment caused by infrastructure development. Deliberate efforts at local, regional, and

State levels to integrate infrastructure and environmental planning and development will help. However, such other institutional mechanisms as environmental performance bond, environmental improvement incentives, and environmental pollution or disruption charges will need to be carefully explored for possible use.

Institutions Providing Land-Use and Comprehensive Planning

Another group of institutions with an important ecological role comprises those providing land-use planning and general purpose or comprehensive planning. It includes State, substate, or multicounty, metropolitan, county, township, and municipal planning units. Some of these units are involved in planning exclusively. Others are involved in planning and development, planning and enforcement, or some combination of these. Some aspects of planners and planning are discussed earlier in this paper.

It is a frustrating but understandable fact of life that the geographic space for planning and managing ecological concerns is generally inconsistent with that which delineates governmental jurisdictions. It is only when governmental jurisdictions cooperate or otherwise join forces that they can bring major ecological problems and management under orderly control.

During the last few years, major advances have occurred in the creation of multicounty and multicommunity planning bodies and in defining their relationship to other planning units. Also during the last few years the existing multicounty and multicommunity planning units have become more comprehensive in their concerns, including those of an ecological nature.

These developments, however, do not guarantee an ecologically trouble-free future. There are some important issues to be resolved.

The geographic coverage of ecological problems or area by multijurisdictional planning units is far from complete. For example, major portions of our State, Michigan, are not served by comprehensive multicounty or multicommunity planning bodies. The same can be said for many other States. Until such coverage is complete, ecological and other environmental concerns, as well as other economic and social concerns, will lack one important forum for their analysis and possible resolution. Thus, a first issue is how to insure that all areas of the country are effectively served by a comprehensive planning unit or service on a continuing basis.

A second, closely related issue is how to insure that there is effective local participation in the future development, management, and preservation of a multicounty or multicommunity region. Those creating and staffing the multijurisdictional planning units will need to insure that these units fulfill at least four roles: (1) solicit and analyze information about problems and preferences from local officials as well as from other local residents; (2) make analyses about the regional constraints and possibilities from ecological, economic, and social points of view; (3) provide careful and deliberate feedback to local officials and residents concerning findings about local and regional situations; (4) indicate to local officials and residents the major options possible, given the constraints and preferences identified. There will undoubtedly be other roles for these multijurisdictional planning units. For instance, it is assumed that one role will be to cooperate closely with other planning units and determine what services can be shared with, provided to, or obtained from those units.

Another key issue pertains to the funding and staffing required for these multijurisdictional units. Funds and personnel are required for their creation and staffing. These funds should include authorizations and encouragements for the addition of staff competent to conduct analyses and make judgments about ecological constraints and regional possibilities within those constraints.

It is clear that Federal and State funds will be required for the creation and support of comprehensive multijurisdictional planning units. The basic roles required for both the consideration of local preferences and problems and analyses of ecological constraints and regional possibilities clearly exceed financial capabilities of many local governmental units. Further, since planning must be continuous to be most effective, this support must also be continuous for the foreseeable future.

It is clear also that current planning units could place more emphasis on the roles we have identified within current financial resources. Some could place greater emphasis on identification of environmental constraints, on local feelings about those constraints, and on priorities about actions in view of those constrained. Local planning units could also promote research or analyses by public and private research units on each of these aspects to augment their effectiveness further. How existing planning units can be encouraged to emphasize these matters is another significant issue.

As a final point, it is clear that ecologically sound planning must be closely associated with an educational effort. The roles identified above require it. Further, the current gap between our scientific knowledge about ecology, and the citizen or local official's understanding of it, also requires an educational effort. Some of the techniques for such an educational effort are treated briefly in the final section on institutions.

Institutions for Environmental Controls and Incentives

Still another important group of institutions comprises those that have, or should have, authority to exert environmental controls or provide environmental incentives. Included in this group would be some of the same units mentioned in the first category; namely, institutions to identify environmental limits and tolerances. Also in this group are Federal and State offices of the attorney general or secretary of state, environmental enforcement units, natural resource enforcement agencies, as well as quasi-public and citizen groups, and the financial and banking sector.

Controls and incentives are not an end in themselves. They are a means to an end. In this case, they are a means of insuring that we do not exceed the ecological limits or constraints of an area or region.

As a society, we have often imposed environmental controls without a clear indication of the ecological ends sought, and how those ends might differ from region to region. Further, we have made very little use of environmental incentives. Thus we see several related issues or considerations.

First, we need considerably more effort on the identification of ecological ends we seek and how they differ; it appears that the substate regions provide an excellent aggregation for the development of specific goals.

Second, and closely related, we need to facilitate the development of ecological goals for those areas or regions in which the residents desire a more pristine environment than can be provided by minimums established at the national or State level. Here we will need to research and design the legal-institutional means to permit such choices and actions.

Third, we need to give particular attention to possible public and private, market and nonmarket incentives. With a few notable exceptions, the incentive mechanism appears to be one of the least considered and least used of our environmental improvement tools.

Fourth, we need to give particular attention to another institutional tool. It is the internalization of the environmental costs of production, marketing, and consumption within the price of a product. Neither the measurement and valuation of those costs nor the possible techniques for internalizing all of them has received the attention deserved. The chapter in this book by Ralph d'Arge examines market-related approaches for enhancing the environment. We recommend it to the reader and will not repeat what is treated there.

An added point to be made here is that we do need institutions with the authority to exert environmental controls and provide incentives. Such institutions, however, cannot be effective over time unless we effectively address at least the four concerns mentioned in this section.

Institutions To Guide Development Within Environmental Constraints

We have emphasized in this paper the necessity for identifying ecological constraints on limits as well as ecological tolerances. We have likened this to a stage on which the economics and social transformations and transactions occur and to which they are linked. Within the ecological constraints of any area, there are opportunities for alternative uses or developments. Thus, it is only logical to look to institutions that can directly affect the consideration of, and choice among, alternative uses or developments.

We find it useful to group together those institutions that have or should have authority to exert controls or provide incentives for guidance of development within the environmental constraints. Included in this group are some of the same institutions that appear in the first, second, and third groups mentioned above. However, it would appear that some new institutional arrangements would be in order to handle some of these functions. But before we set about the task, there are some necessary prerequisites.

We are again confronted with the need to identify the purpose of controls and incentives. We know little about the consequences of alternative settlement patterns. For example, we suspect that the settlement patterns which provide the greatest individual freedom of action will not be those that are most sensitive ecologically, the most efficient economically, or that best meet other social goals. We urgently need analyses by practitioners and scholars alike of (1) the consequences of possible alternative settlement patterns and (2) the settlement patterns that would best meet alternative ecological, economic, and social goals. Given such analyses we can modify or forge institutions to help guide us to preferred settlement patterns within the environmental constraints.

Institutions That Have Educational and Informational Roles

Experiences in natural resource planning and in broader comprehensive planning show convincingly the crucial role of another group of institutions. They are those that have educational and informational roles in soliciting, analyzing, and presenting information on the full range of ecological and environmental conditions. There are a tremendous number of governmental agencies, public and private groups, educational units, research agencies and groups, including public and private colleges and universities, involved in these endeavors. Still we have an enormous gap between science and the citizen.

We see both needs and opportunities for some more creative institutional approaches to the educational and informational roles. For example, the concept of an environmental demonstration project for ongoing analysis and public education is grossly underutilized. We have not taken the genius of the agricultural demonstration projects, with its successful use of demonstration fields, practices, livestock management, etc., in land grant institutions, and applied it to our current environmental problems. We could in fact have key environmental demonstration projects in every State and substate region. They could focus on resource use and protection and on waste conversion and assimilation to show, simply and convincingly, relationships that are currently difficult to visualize or understand in the abstract. These demonstration projects could invoke local pride and local ecological or environmental sensitivities and, at the same time, create environmental understanding. Further, they could be a legacy to succeeding citizens and political leaders and planning practitioners. Hopefully the planning practitioners, as well as others, would be involved in their planning, design, construction, and use.

A second concept that has not been considered is that of environmental networks. We observe that much academic energy is consumed in efforts to build "an" environmental center or "the" environmental center for a State. We feel that the concept of a State environmental network that draws on unique competences from throughout a State for educational and informational purposes is operationally and economically more feasible.

A third concept is to build on, and utilize more fully, systems that have research applications and educational information roles as their primary concerns. Much greater use could be made of the agricultural experiment stations and the Cooperative Extension Services in ecological analyses, education, and information. They are doing much in these areas now, including some interesting pioneering efforts in environmental demonstrations.

There are other institutional approaches that are possible. For example there is a range of possibilities for joint program planning, joint staffing, joint analyses, and joint educational efforts between educational units and the operating agencies or planning units at the State, substate, and local levels. Working together they should be able to magnify the applicability of their efforts and the resulting positive impacts.

Again, financial support of these activities is crucial. The ecological problems we face are very sizable. The educational and informational effort that must be undertaken, including the specificity of that effort at substate and local levels, is equally sizable. But there is abundant information available indicating that these changes in institutional responsibilities and structures are essential if society really desires to incorporate an ecological ethic into its planning and management processes.

Chapter 9

AN EVALUATION OF THE IMPACT OF LAND USE ON ENVIRONMENTAL QUALITY

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INTRODUCTION

The relationship between land use and environmental quality has, for many years, been tacitly recognized by comprehensive planners and the administrators of local, State, and Federal environmental protection programs. DeMarrais[1] and Williams et al.[2] have suggested preventive air pollution control programs based on land use, and performance standards zoning ordinances such as Chicago's represent an early attempt to introduce a full range of environmental controls into the urban land development process.

In spite of this recognition, however, the thrust of the national environmental protection program, at every level of government, has until very recently focused almost exclusively on the implementation of programs involving the application of the most cost-effective technological controls to existing sources of pollution. Such programs tend to emphasize regulatory and enforcement mechanisms based on comprehensive source surveillance and inspection activities backed up by operating permit and licensing systems.

The air and water pollution control guidelines that were promulgated under the authority of the Federal Clean Air Act (1970) and the Water Pollution Control Act call for the development of comprehensive pollution control plans for metropolitan regions and river basins. These plans are required to reflect the spatial distribution of sources of air and water pollution. Federal agency operating grants for air pollution control, and facility construction grants for municipal wastewater treatment systems, provide an economic incentive for State and local government to design programs that consider the combined emissions of a variety of pollution sources and meteorological, hydrological, and geological characteristics of a control region. This planning generally requires the compilation of detailed pollution source inventories, an appropriate geophysical data base, and the analysis of ambient environmental quality data derived from networks of monitoring stations. Atmospheric and hydrologic transport and dispersion models are applied to these data to derive estimates of the relationship between pollution emissions and ambient environmental quality.

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[1] DeMarrais, G.: "Meteorology for Land Development Planning in the Tulsa Metropolitan Area," Tech. Dept. A61-5, U.S. Dept. of HEW, Cincinnati, Ohio, 1961.

[2] Williams, J., et al.: "Air Pollutant Emissions Related to Land Area—A Basis for a Preventive Air Pollution Control Program," U.S. Dept. of HEW, July 1968.

Because of the wide variety of source types and transport phenomena associated with the design of comprehensive pollution control programs, a substantial number of physical and socioeconomic planning models has been developed in recent years. Table 9.1, which illustrates the array of planning models that are presently employed by the Argonne National Laboratory Center for Environmental Studies, indicates the extent of the analytical capability currently required to support Federal, State, and local environmental protection planning activities.

These models simulate the effectiveness of source controls, such as: (1) the application of emission control devices to pollution-producing activities; (2) the substitution of fuels or materials in processing operations; (3) the construction of new or upgraded public works facilities; (4) the curtailment or relocation of activities not susceptible to direct technological regulation. Regional control strategies for a given medium (air, water, etc.) are synthesized from a mix of such controls, and can be tested simultaneously in an environmental-quality simulation model. Demographic and economic growth estimates are translated into a projected emission inventory to which proposed regulatory mechanisms are applied. The transport and dispersion models then yield ambient environmental-quality estimates, which, in principle, indicate the susceptibility of the proposed regulatory program to obsolescence as a result of urban growth and development processes.

Despite the fact that current environmental control practices consider the present and future distribution of pollution-producing sources, they remain technology oriented and accord only peripheral recognition to the environmental/land-use quality relationship.

In fairness, it is not altogether true to assert that the environmental/land-use quality relationship has been consistently neglected by planners. As we have already noted, it has long been recognized and applied (with limited success) at the neighborhood level through local zoning ordinances. Moreover, many regional planning agencies have introduced environmental quality considerations into long-range comprehensive development plans. Nevertheless, beyond the spatial scale of individual neighborhoods, the technology-oriented regulatory programs (which are the focus of enforcement-oriented environmental protection agencies at every level of government) generally fail to consider the potential effectiveness of locational strategies for pollution control, even in

Table 9.1 Environmental Protection Planning Models at Argonne National Laboratories*

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ENVIRONMENTAL PROTECTION PLANNING MODELS AT ARGONNE NATIONAL LABORATORIES*

	FUNCTION / POLLUTANT	SOCIOECONOMIC ACTIVITY MODELS				
		GROWTH PROJECTION (Population and Employment)	SPATIAL ALLOCATION	ACTIVITY AND WASTE GENERATION	TRANSPORT AND DISPERSION	POLICY AND STRATEGY EVALUATION
ENVIRONMENTAL MODELS	AIR POLLUTION	1. Air Quality Control Region (ANL) 2. Airport Land Use (ANL) 3. Ground Transportation Demand (CATS) 4. DEMOS (Battelle-Columbus) 5. Illinois Growth Model (National Planning Association)	1. Lowry I 2. PLUM 3. EMPIRIC 4. Air Pollution/Land Use (ANL) 5. Airgonne Distribution Model (ANL) 6. Ground Transportation Distribution and Assignment (CATS)	1. Power Plant System 2. Residential-Commercial Fuel Use 3. Industrial Fuel Use 4. Industrial Fuel Use 5. Airport Activity 6. Ground Transportation 7. Land Use – Emissions	1. Air Quality Display Model (AQDM) 2. Stationary Source Transient (24 Hour) Model 3. Argonne Steady State Model (ASSM) 4. Finite Line Source Model (Traffic Linkage) 5. Photochemical Transient Model	1. Stationary Source Control Strategy Simulation 2. Stationary Source Control Cost 3. Vehicular Control Strategy 4. Vehicular Control Economic Incentives 5. Residential-Commercial Cost Revenue Model
	WATER POLLUTION	1. River Basin Growth (ANL) 2. DEMOS (BCL) 3. Illinois Growth Model (NPA) 4. Urban/Rural Land Use (ANL) 5. Mining Activity (ANL)	1. River Basin Land Use 2. Illinois Allocation Model (NPA) 3. Lowry I 4. PLUM 5. EMPIRIC	1. Municipal Waste Water Discharge 2. Industrial Waste Water Discharge 3. Land Use – Runoff	1. River Basin Surface Hydrology 2. River Basin Water Quality	1. Waste Water Treatment Plant and Collection System Cost
	SOLID WASTE	1. DEMOS (BCL) 2. Municipal Projection (ANL) 3. Illinois Growth Model (NPA)	1. RAM – Mode I (Roy F. Weston) Service Area Designation	1. RAM (Roy F. Weston) Solid Waste Generation	1. RAM (Roy F. Weston) Collection and Disposal System Simulation	1. RAM – Mode II, III (Roy F. Weston) Linear Programming Package
	WASTE ENERGY	1. Regional Power Demand (ANL) 2. Ground Transportation Demand (CATS)	1. Regional Power Demand Distribution 2. Ground Transportation Distribution and Assignment	1. Ground Transportation 2. Airport Activity 3. Power Plant System	1. Thermal Energy Dispersion in Very Large Lakes 2. DOT/FAA Noise Contours	1. Power Plant Capital Investment 2. Cooling System Cost

*Most of the models listed here are operational or near-operational at present. The remainder are available at Argonne as documented computer packages that have not yet been achieved.

situations where the best available control technology cannot achieve environmental quality standards.

The installation of emission control devices, completion of fuel and process conversion programs, construction and upgrading of wastewater treatment facilities, etc., which result from this planning will significantly control environmental pollution, but in many instances such controls may not be sufficient. Even in areas where existing pollution control technology can temporarily achieve environmental quality standards, rapid development may render present control regulations and programs ineffective within a few years. Most sophisticated pollution control plans do not reflect the economic and population trends which have led to environmental degradation. The pressures of economic growth and development, proliferation of transportation systems, increasing population densities, and rapid expansion in housing developments may pose both actual and potential threats to the maintenance of environmental standards. Since, in many cases, environmental quality standards cannot be achieved by technology-oriented pollution control programs alone, we should consider environmental protection within the broader perspective or urban and regional development.

ASSIMILATIVE CAPACITY AND ENVIRONMENTAL QUALITY STANDARDS

Land can be viewed as a medium for the retention or transmission of environmental contaminants, although the effects of land contamination are generally manifested through one of the fluid media. As is the case for the other media, the "capacity" of a parcel of land to assimilate environmental pollutants is dependent not only on its physical characteristics but also on manmade environmental quality standards based on biological, societal, functional, or esthetic damage criteria.

Land may become polluted as a result of a variety of activities. For example, leachates from livestock feedlots, inappropriately sited sanitary landfills and septic fields, toxic industrial wastes from improperly located land disposal sites, and acid mine drainage may lead to the pollution of permeable substrata that serve as the water supply for residential communities. In some cases aquifers may be hydrologically coupled to adjacent surface waters, so that the percolation of polluted groundwater may also result in the contamination of streams and lakes. The reverse of this process can also occur, where permeable strata are periodically recharged from polluted streams. For example, an industrial land disposal site in New Jersey that receives some 20,000 gallons of toxic wastes per week may be responsible for contaminating both the local groundwater supply and an adjacent tributary of the Delaware River. In Orange County, Fla., runoff from urbanized areas, discharges from the citrus-processing industry, and pesticides and fertilizers deposited as a result of agricultural activities are reported to have resulted in the pollution of water-bearing strata.

The capacity of water-bearing soils to tolerate such discharges is clearly related to various geophysical determinants that include soil permeability, the presence of protective strata of impermeable caprock, the extent and depth of the water-bearing formation, and the degree to which it is hydrologically coupled to adjacent surface-water resources. The demand for such groundwater resources also defines their waste-assimilation capacity, but these parameters are socioeconomic in nature and are related to the type and intensity of land development that is intended and the water-quality standards that apply. To assess the magnitude of this land-related pollution problem, better subsurface hydrological and water-quality models are required, and a more comprehensive experimental data base is needed.

Polluted surface runoff from developed land contributes to the contamination of streams and lakes. The volume and quality of runoff waters is greatly dependent on the capacity of the soil to absorb rainfall. This capacity is significantly affected by extensive paving of urban areas—a phenomenon which frequently leads to overtaxing the capacity of combined storm/sanitary sewers and results in the discharge of untreated sanitary wastes into natural receiving waters. Improved runoff models and more experimental data are needed to evaluate this land-use-related pollution problem.

Assimilative capacity is dependent on the sensitivity to pollution of the bioecological system supported by a given parcel of land. The relative vulnerability of coniferous vegetation to airborne sulfur oxides, the adverse response of some forms of plantlife to pollution-induced changes in soil alkalinity or acidity, and the impact of pesticides on the reproductive cycle of large predatory birds show how the limited adaptive capability of ecological systems is inseparably linked to specific habitats. Man is, of course, a part of this bioecological system, and some human activities (such as those that occur in hospitals, nursing homes, schools, etc.) are more sensitive to environmental degradation than others.

The geophysical and topographical characteristics of land can also exert a significant influence on the assimilative capacity of the other media. The most dramatic evidence of this is provided in areas such as the Los Angeles basin or the Willamette Valley of Oregon, where a dominant topographical feature, in combination with prevailing meteorological conditions, produces a susceptibility to atmospheric pollution that antedates the era of intensive urbanization. A similar situation exists where bodies of water that are topographically confined, create relatively stagnant subbasins or bays in which flushing is infrequent and turnover times are long. The southern Lake Michigan basin is a case in point. The capacity of such bodies of water to assimilate pollutants is much less than where receiving waters are more rapidly replaced.

In principle, at least, the type and intensity of land development and the attendant waste-generation processes can be matched to the capacity of the land resource to assimilate environmental pollutants without unacceptable degradation of environmental quality. Although the application of technological emission controls to pollution-producing sources may significantly relax these capacity constraints, nothing less than a "zero discharge" or closed-cycle processing technology can altogether remove them. One of the complications associated with the application of many pollution control devices and systems is their tendency to generate adverse side effects. For instance, the efficiency of the electrostatic precipitators, which are used to capture particulate matter suspended in stack gases, decreases significantly as the sulfur oxide concentrations in the effluent gases are reduced. A wet scrubber, on the other hand, effectively filters out suspended particulates, but transforms an air pollutant into a water pollutant. Similarly, automotive emission controls that reduce hydrocarbon discharges tend to increase the yield of nitrogen oxides.

The necessity for accepting such limitations in the current technology of pollution control makes matching a land development plan to the assimilative capacities for a variety of pollutants a complicated proposition.

In some instances, comprehensive regional plans have included explicit recognition of development constraints due to the limited assimilative capacity of the land. The Lake Tahoe and Atlanta metropolitan regional plans are noteworthy cases in point. A generally applicable multiple-use capacity catalog for land use is not yet available and would be of great value to comprehensive planners.

One of the more noteworthy features of the national environmental protection program, as it has developed under EPA and its predecessors, is the very marked trend toward uniform national emission and environmental quality standards. This tendency has been promoted by: (1) the complexity of the problem of developing multipollutant standards; (2) equity considerations; (3) the very real need to inhibit a precipitate migration of pollution-producing activities from urban areas (where they represent a major component of the employment and tax base) to "polluter's havens" established by local and State governments seeking advantages from locally lax pollution-control standards. The adoption of uniform, single-pollutant emission and environmental quality standards, whatever their conceptual, administrative, and esthetic appeal, diminishes the possibility of taking advantage of spatial variations in the capacity to assimilate pollutants or of inducing desirable spatial concentrations of related pollution-producing activities.

The precedent established in the Ruhr Valley of Germany, which is a polluter's refuge, indicates that there is another side to the uniform standards issue. The development of spatially varying, multipollutant standards, based on variations in waste assimilation capacity, might lead to a national environmental protection program that is more economically feasible. Thus the current single-pollutant, uniform standards policy might well be reconsidered; if nonuniform, multipollutant standards should prove attractive, environmentally oriented land-use planning would be of paramount importance.

ENVIRONMENTAL PROBLEMS CREATED BY CURRENT LAND DEVELOPMENT PRACTICES

Although environmental protection planners generally view land as a site for pollution-producing activities, a variety of land-related natural processes also release significant amounts of chemical pollutants.[3]

Natural land-related sources of pollutants include marshlands that yield methane and related gases, desert terrain (typified by the areas around Tucson and Phoenix, Ariz.) that frequently produces massive dust storms, volcanic regions that generate sulfur oxides, and wooded areas in temperate zones that may produce substantial amounts of carbon monoxide as a result of the annual autumn destruction of chlorophyll. Such sources are not generally susceptible to direct technological control, and most are so ubiquitous that it is impractical to resort to locational strategies; but to the extent that they contribute to ambient concentrations, they constrain the distribution and magnitude of manmade pollution.

Of considerably greater significance is the role that land use plays in inducing the construction and use of transportation and other public service systems that are major sources of environmental pollutants. Since the advent, shortly after World War II, of large regional transportation planning agencies such as the Chicago Area Transportation Study and its counterparts in New York City, Pittsburgh, the San Francisco Bay area, and elsewhere, the planning and deployment of major highway and mass transit systems has been overtly and explicitly demand oriented. Justification for the capacity and routing of regionwide transportation systems has almost invariably been based on estimates of the spatial distribution of demographic and economic growth during the projected economic life of the proposed facilities. These estimates are derived from the analysis of recent historical traffic-flow data and the present and projected land-use patterns. Once a major facility has been constructed to accommodate projected travel demands, the improved accessibility tends to transform the growth estimates of the transportation planner into a self-fulfilling prophecy. The 25-30-year economic lifetimes of these extremely costly projects and the equally long-lived land development patterns that they induce lend an element of socioeconomic irreversibility to the consequent environmental problems.

The impact of highway systems on urban air quality has been subjected to extensive study by the Federal Environmental Protection Agency (EPA). As of January 1972, many major urban areas will apparently not attain air-quality standards for hydrocarbons, carbon monoxide, and oxides of nitrogen unless current emission control technology is supplemented by some form of transportation system control. Among the urban areas on this list are Los Angeles, New York City, Sacramento, Seattle, Boston, Salt Lake City, Denver, San Francisco, Dayton, Phoenix, Fairbanks, Minneapolis-St. Paul, Baltimore, San Diego, Las Vegas, Houston, San Antonio, and El Paso. Highway systems are also sources of noise, miscellaneous solid refuse, and, in the snow belt, they are massive sources of deicing salt.

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[3] Recent studies at Argonne National Laboratory indicate that more than 80 percent of global annual average ambient carbon monoxide concentrations may be derived from natural sources.

Current trends toward the substitution of electric mass transit facilities for highway systems in densely populated urban areas could lead to a reduction in the discharge of air pollutants from internal combustion engines. However, the resulting demand for electrical energy could be expected to increase emissions of sulfur oxides, suspended particulates, and waste heat by central station powerplants.

A variety of operational controls have been suggested, and in some cases adopted, to alter the diurnal pattern of urban traffic flow in order to achieve improved service or other benefits. Some of these may be expected to influence the pollution-producing potential of these systems. For example, freeway access controls of the kind used in Chicago tend to reduce the concentration of vehicles and increase travel speeds. Consequently, locally high vehicular air pollution emissions are diminished as a result of dispersing traffic and gaining the engine efficiency associated with the higher speeds.

Subsidization of mass transit systems to reduce fares, combined with such measures as the exclusive dedication of lanes to buses, as is currently practiced in the Washington, D.C. area, could shift ridership from highways to public transportation facilities, with a resulting decrease in traffic congestion and attendant air pollution and noise levels. The effects of fare changes are not well understood, but there is some evidence that mass transit ridership is relatively insensitive to downward shifts, but responds negatively to upward changes. Staggered working hours would smooth the diurnal distribution of transportation-related emissions and reduce the peak ambient pollution concentrations. A 4-day workweek might be expected to yield a 20-percent reduction in journeys-to-work, but could result in an offsetting increase in shopping trips and recreational travel.

All efforts to minimize the environmental impact of transportation systems tend to overlook the fact that they are deployed in direct response to present and anticipated land-use patterns. In turn, they have a profound impact on the spatial distribution of population and economic activity. To the extent that regional land-use plans imply a demand for pollution-producing transportation systems (which has almost invariably been satisfied in the past), they may be viewed as a primary source of environmental degradation and should be the object of long-range pollution control planning.

The deployment of transportation facilities has historically exerted a significant influence on settlement patterns and the location of industrial activities. The physical form of most major cities that experienced substantial growth during the 19th century was determined by the geometry of the rail, water, and road systems that served these developing areas. For example, Chicago's radial growth pattern can be readily traced to the confluence of major railroads, and the deployment of horsecar lines constructed to insure the accessibility of outlying residential neighborhoods to the central business district that represented the 19th and early-20th-century focus of commercial and industrial activity.

This pattern was reinforced after World War II by the construction of major freeway facilities that paralleled the original rail lines in most cases. With the establishment of these freeways, however, substantial outmigration of industry, commercial activity, and residential development became possible, and the pattern of radial urban sprawl that currently characterizes the Metropolitan Chicago region was induced. Similar development can be traced in most other major metropolitan areas. Thus, the provision of ground transportation systems is one of the direct causes of the settlement patterns and concentrations of pollution-producing activities that characterize highly urbanized areas. To the extent that such facilities promote environmentally undesirable clusters of pollution sources or enable them to be sited adjacent to environmentally sensitive populations or activities, ground transportation may be regarded as an indirect cause of environmental degradation.

Major commercial airports provide another significant example of pollution-producing facilities which almost invariably induce the concentration of other pollution sources. A major airport such as O'Hare, Los Angeles International Airport, or JFK is, in many respects, equivalent to a miniature urban concentration. It has been demonstrated that the density of emissions of carbon monoxide, hydrocarbons, and oxides of nitrogen from such large commercial airports is equivalent to that generated by highly industrialized tracts of urban land.

In addition to the air and water pollutants, solid waste, and noise attributed directly to aircraft operations, an airport normally attracts related commercial and industrial activities which are themselves sources of environmental contaminants. The access roads linking the airport with adjacent urban areas are often significant sources of ground-transportation-related pollution, including hydrocarbons, carbon monoxide, oxides of nitrogen, road-deicing salt, and noise. Moreover, the improved accessibility to the airport provides an inducement for non-airport-related industrial and commercial activity to establish itself in the vicinity. The familiar pattern of secondary and tertiary service facilities, residential developments for employees living near the airport, and the attendant requirement for public utilities to serve this population, constitutes a secondary urban concentration that may, in many cases, be substantially less compatible with the capacity of the local environment to assimilate pollutants than is the parent city the airport was designed to serve.

In view of the direct relationship between projected land development patterns and the pollution-producing transportation systems that invariably accompany them, it is clearly necessary to consider environmental impacts when planning urban settlement patterns for new towns, satellite cities, new towns-in-town, cluster settlements, radial urban developments, ring cities, industrial/residential parts, etc. In many cases, particularly in areas that for geophysical or bioecological reasons have a limited capacity to assimilate environmental pollutants, urban design may be dominated, or at least very significantly influenced, by the need to minimize people-moving and goods-moving activities. Development in environmentally sensitive areas could be limited by the need to deploy transportation systems compatible with environmental quality standards, and otherwise attractive urban designs may, in some cases, be compromised by their transportation-system-related pollution potential.

In fairness, we should observe that transportation is by no means the only land-use-oriented pollution-producing utility that is deployed in direct response to projected service demands. Municipal wastewater collection and treatment systems are also designed on the basis of present and anticipated land development. Once these systems are available, they induce, or at least enable, intensive development in areas previously constrained by the lack of sewage facilities. The conflict between the construction programs of the Metropolitan Sanitary District of Greater Chicago and the comprehensive plans of the Northeastern Illinois Planning Commission offers a classical example of the frequent incompatibility between demand-oriented and normative planning. Restrictions placed on the construction of wastewater collection systems in Fairfax County, Va., Du Page County, Ill., and elsewhere have had the effect of imposing a moratorium on land development in these areas. Again, because these systems are designed in response to projected land use, land may be viewed both as a prime causal factor of the wastewater discharged by municipal treatment plants and as a means of imposing long-range constraints on the concentrations of population and economic activities that generate these wastes.

LAND GUIDANCE AS A MECHANISM FOR ENVIRONMENTAL PROTECTION

Kennedy[4] and others have shown that there is a fairly close relationship between the types and quantity of environmental pollutants produced by a given parcel of land and the use and level of intensity to which that land has been developed. The impact on ambient air and water quality of the spatial distribution of pollution-producing activities has also been demonstrated through the use of atmospheric and hydrologic transport and dispersion models. It follows, in principle at least, that controls imposed on the distribution and intensity of land use should be at least as effective, and substantially more flexible, than source-oriented technology controls (because land-use-based restrictions on pollutant emissions need not be linked explicitly to any specific process or emission control schemes). The Cook County, Ill., emission density zoning controls, which restricted the allowable rate of emission of certain air pollutants per occupied acre of land, represent an early, albeit ineffective, attempt to take advantage of this concept. Croke and Roberts[7] suggested a methodology for optimizing an air pollution emission density land-use plan, and the EPA is currently sponsoring a study to introduce a land-use algorithm into the Federal "Air Quality Display Model" used for regional control planning. In a similar vein, the State of Illinois has recently explored the feasibility of establishing buffer zones between agricultural areas saturated with pesticides and fertilizers and adjacent natural receiving waters that could be contaminated by polluted runoff.

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[4] Kennedy, A., et al.: "Air Pollution-Land Use Planning Project—Phase I Final Report," Argonne National Laboratory Report ANL/ES-7, July 1971.

[5] Roberts, J., et al.: "An Urban Atmospheric Dispersion Model," Argonne National Laboratory Report ANL/ES-CC-007, 1970.

[6] Hamilton, H., et al., "Systems Simulation for Regional Analyses: An Application to River Basin Planning," The MIT Press: Cambridge, Mass., 1969.

[7] Croke, E., and Roberts, J.: "Air Resource Management and Regional Planning," *Bull. At. Sci.*, Feb. 1971.

Despite this history, comprehensive emission density limitations and environmental buffer zoning are at present little more than conceptually attractive devices for regulating the pollution potential of alternative land-use patterns. There are a number of other approaches that appear to be equally promising. In fact, the system of land guidance techniques normally applied by comprehensive planning agencies includes a wide variety of schemes which can be categorized under the general heading of advice, controls, inducements, development, and acquisition (Reps[8]).

Advice supplied by planning agencies to officials, Government agencies, private organizations, and individuals is the commonest approach. This is frequently provided in the form of a comprehensive plan or a projected community capital improvement program. Direct controls are implemented through zoning ordinances, subdivision regulations, official maps, and building codes. Development incentives or disincentives, on the other hand, take such forms as the planned unit development, density bonuses for construction providing certain amenities, low-interest loans, tax incentives, and direct subsidization. Public acquisition of lands for public works projects, forest preserves, or greenbelts is the most direct, albeit the most expensive, mode of land use control.

Although the utilization of such schemes to control pollution is not common as yet, environmental objectives have been introduced into many land-use guidance activities. For instance, airport, flood-plain, agricultural, conservation, and performance standards zoning all reflect environmental quality concerns. Moreover, hillside grading regulations and the purchase of easements or development rights have frequently been employed to reduce erosion or preserve scenic areas.

While land-use-oriented pollution controls are normally considered in a negative or restrictive context, it is important to note that there is a positive side to the tendency of pollution-producing activities to be densely concentrated. The dispersal of residential communities and suburban industrial operations can inhibit the deployment of large, efficient, centralized wastewater treatment and solid-waste-disposal facilities. The clustering of related activities can reduce significantly the cost of pollution control as demonstrated by a complex of metal plating plants in Cleveland that take advantage of joint waste treatment and reclamation systems. The emphasis that the Federal construction grant program for wastewater treatment facilities places on the identification of opportunities for achieving economies by constructing large central multimunicipal treatment plants also reflects this fact.

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[8] Reps, J.: "Requiem for Zoning," *Planning 1964* (ASPO, 1964).

As indicated above, providing or withholding public utilities such as transportation systems, water supply and wastewater treatment facilities, energy distribution systems, etc., is a potentially significant means of inducing environmentally desirable land development. In principle, economic incentives, such as spatially sensitive property taxes and pricing policies that internalize the societal cost of pollution, could also be employed to achieve preferred development patterns. To design such economic incentives, more quantified information is needed on the environmental costs and benefits associated with land development.

Ridker[9] and Woodcock[10] have investigated the costs and benefits of air pollution control, and other attempts have been made to quantify the economic impact of pollution on health, property, and recreational potential, but the significance of environmental quality as a determinant of the market value of land has, as yet, scarcely been evaluated. Although urban geographers such as Berry and Horton[11] have identified socioeconomic land-use descriptors, and economists such as Moses, Muth, and Alonso[12] have indicated the significance of accessibility to transportation facilities, commercial centers, and recreational areas in the competition for land, the impact on land values of air and water quality has been less easy to characterize. In part, this may be because the latter constitute second-order amenities for which the demand is relatively inelastic. It is also likely that until comparatively recently such investigations have been inhibited by the dearth of data and the pollution transport and dispersion models required to estimate the impact of environmental quality on land values.

There is evidence in some cases that environmental quality can exert a fairly significant first-order influence on land values. For example, there are indications that the construction of wastewater treatment facilities along some highly polluted rivers have yielded a sufficient improvement in water quality to encourage intensive shoreline development. On the other hand, the progressive enlargement of jet-noise zones has exerted a negative effect on apartment rentals and the resale value of homes in the vicinity of airports.

As yet, the economic impact of pollution on land values and urban settlement patterns has not been effectively integrated into the assessment of the costs and benefits of environmental protection. It is probably not unreasonable to predict that it will be found to be a fairly substantial disbenefit when it is finally quantified.

If environmentally oriented land-use planning is to be realized, improved systems for land-use monitoring and data management are required. High-altitude infrared, visible light aerial, and satellite photography offer a promising avenue for the development of routine periodic monitoring programs. Such remote-sensing techniques are currently being explored and applied for land-use monitoring purposes at the NASA Manned Spacecraft Center in Houston, and as a part of the Earth Resources Technology Satellite (ERTS) program by the NASA Goddard Space Flight Center sponsored by the Departments of the Interior and Agriculture.

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[9] Ridker, R.: "The Economic Costs of Air Pollution: Studies in Measurement," Praeger: New York, 1967.

[10] Woodcock, K.: "A Model for Regional Air Pollution Cost/Benefit Analysis," EPA report prepared under contract No. PH 22-68-60, May 1971.

[11] Berry, B., and Horton, F.: "Geographic Perspectives on Urban Systems," Prentice-Hall: Englewood Cliffs, N.J., 1970.

[12] Moses, L., and Williamson, H.: "The Location of Economic Activity in Cities," *Urban Economics*, W. Leahy, D. McKee, and R. Dean (eds.), The Free Press: New York, 1970.

The utilization of this and other sources of land-use data for environmental protection planning is inhibited by the lack of an environmentally oriented land-use taxonomic system. Current schemes, including the Standard Industrial Classification System and the Standard Land Use Code, were not designed to reflect the pollution-producing or assimilating capacity of alternative land uses.

Finally, although land-use storage and retrieval systems such as NARIS, and environmental data management systems such as Air Pollution Information and Computation System (APICS), Storage and Retrieval of Aerometric Data (SAROAD), and Storage and Retrieval (STORET) have been developed in recent years, systems adapted to the simultaneous storage of geocoded and time-series-stored land use, pollution source, transport media, and environmental quality data are needed. Such systems should include statistical packages, evaluative models, and appropriate output display schemes in order to facilitate the analysis of environmental quality and land development data.

FEDERAL AUTHORITY TO IMPLEMENT ENVIRONMENTAL/LAND-USE CONTROLS

To the extent that environmental quality considerations have thus far been introduced into the land-use planning and guidance process, regional comprehensive planning agencies, conservation and development commissions and, more recently, State institutions such as those established in Vermont, Maine, Hawaii, and Washington State have been the most active agents. With the advent of the National Environmental Policy Act (NEPA) of 1969 and the flurry of legislative activity that has produced the public land policy bill (H.R. 7211), the national land-use policy bill (S. 992/H.R. 4332), the land and water resources bill (S. 632), and the National Coastal and estuarine zone management bill (S. 582), the stage is set for a considerably more vigorous Federal role in environmentally oriented land management.

The NEPA requires the development of detailed impact statements for all Federal projects likely to involve a significant effect on environmental quality. The public land policy bill would provide guidelines for the use of federally administered lands and would institute a grant mechanism for State and local coordination of the use of these lands. The land-use policy bill requires the States to manage land use in areas of critical environmental concern, while the land and water resources bill would establish a Federal land and water resources council. The national coastal and estuarine zone management bill states a policy for the conservation of these zones and provides for grants to aid State governments in the development of appropriate management programs.

Among the Federal agencies most likely to become involved in environmentally related land guidance programs are the Departments of Interior, Agriculture, Housing and Urban Development, Transportation, HEW, and Commerce, as well as the EPA, the Federal Power Commission, the Atomic Energy Commission, and the Office of Economic Opportunity. These agencies are currently recognized by the Council on Environmental Quality as having jurisdiction or special expertise to evaluate land-use and management-related aspects of NEPA environmental impact statements.

Among these agencies, the potential role of the EPA is of particular interest in view of its past focus on more conventional technological controls. The extent to which the EPA regulatory mandate can be broadened to include land guidance is likely to be constrained by the jurisdictional claims of other land-use-oriented agencies—particularly the Departments of the Interior, HUD, and DOT. At present, the statutory authority for EPA to utilize land guidance as a control mode is indirect and, in many respects, quite limited.

Section 110 of the Clean Air Act specifies that the EPA Administrator must consider the need for land-use and transportation controls before approving regional air pollution implementation plans submitted by the States.

Sections 8 and 22 of the Water Pollution Control Act prohibit the EPA from making construction grants for wastewater treatment facilities unless the project is integrated into a regional and river basin plan. The Federal guidelines for the preparation of these plans specify the need for land-use analysis and encourage the incorporation of land-use control schemes in water-quality management programs. This provision is reinforced by the requirement that HUD-designated area planning offices (nearly always comprehensive planning agencies) review and approve proposed construction programs.

Under the authority of the Solid Waste Disposal Act of 1965 and the Resource Recovery Act of 1970, EPA has authority to provide planning and demonstration grants for solid-waste management, provided that the recipients develop a comprehensive solid-waste plan. Implicit in this arrangement is the authority to require that such plans take account of land-use factors, although this potentiality has not yet been put to the test.

EPA has indirect authority to impose land-use-oriented controls over radionuclide emissions via the Atomic Energy Act of 1954, and an equally indirect mandate for noise control derived from the National Environmental Policy Act of 1969 and the amended Clean Air Act. It is very difficult to interpret either the Insecticide, Fungicide, and Rodenticide Act of 1947 or the Environmental Pesticide Control Act of 1971 as conveying any authority to EPA to implement land-use-oriented pesticide controls.

CONCLUSION

The integration of land-use guidance and environmental protection seems likely to become an increasingly important issue, as the focus of the national environmental protection program shifts away from the immediate need to apply the best control technology to existing pollution and toward the longer range goal of insuring that such controls are not rendered obsolescent by the dynamic processes that induce the migration and relocation of population and industry. A new perspective on the relationship between land use and environmental quality will be required by regulatory and planning agencies at all levels of government.

Although a wide variety of legislative instruments and institutions addressing the environmental/land-use issue have arisen in recent years, there is no clear emergence of a mandate for the utilization of land guidance as a mode of environmental protection. In part, this is because land use is a complex, multidimensional issue, and its physical, economic, and societal interfaces with environmental protection are not yet well understood. There seems to be a fairly critical need for research to develop methodologies for evaluating these interrelationships, and for assessing the potential effectiveness of alternative, environmentally oriented land guidance policies.

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Chapter 10

PLANNING FOR AREAS OF SIGNIFICANT ENVIRONMENTAL AND AMENITY VALUE

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INTRODUCTION

Planning for areas of special significance is, for at least two reasons, of interest in the broader field of planning of the physical environment. First, the preservation and management of critical areas is one of the goals of planning generally, and good planning for these areas has beneficial effects which radiate far beyond the boundaries of the planning unit (as in the case of a well-managed estuary serving off-site commercial fishing interests and providing on-site scenic preservation). Second, concern for areas of special significance has led to the development of advanced forms of research, planning, and implementation which can serve as models to guide future planning efforts.

The purposes of this paper are to discuss the content and focus of physical environmental planning, to comment on various research approaches being employed and, more specifically, to postulate a number of avenues for research in support of practical work in the field.

The following four sections describe a number of concepts of "significance" and seek to define the issues to which planning must be addressed; present case examples which indicate the types of information that have proved to be of value and the decision points to which research might be directed; outline current research approaches, since presumably new research efforts will be based, at least in part, upon existing linkages between the fields of science and practice; and indicate some specific strategies for research support, so as to provide a background for discussion of research policy.

TARGETS FOR PLANNING: CONCEPTS OF SIGNIFICANCE

Land may be deemed to be of special significance for any of a wide variety of reasons. A large part of the planning process is normally concerned with the definition, inventory, and classification of land, and the requirements for research and data will vary widely in scope, depth, and content, depending on which of the land's attributes are targeted for planning.

Frequently, significance is defined in terms of the land's suitability for specific, high-value uses. California's Williamson Act is aimed at protecting Class I and II soils for agricultural use, and from urban-based tax assessments. Similarly, some counties are enacting large-area zoning regulations (such as Marin County's 20-40-60-acre zoning) to protect and encourage uses such as dairying or viticulture. Certain aspects of coastal zone planning are aimed at maintenance of specialty corps (such as Brussels sprouts or artichokes) dependent on coastal climate.[1]

Physiographic features, such as deep water access, may convey special value in coastal zone planning, as it relates to suitability for port facilities or petrochemical complexes.[2]

Key commodity resources, such as sand, gravel, or limestone (for cement), are common regional planning targets lest these uses be preempted by urban development. Water supply protection and development is also of continuing concern.

Key renewable resources, such as wildlife habitat[3] or forest resources (especially regarding taxation), are commonly involved in special planning efforts. Combinations of attributes may convey recreation suitability; for example, wilderness character, cultural features,[4] or site development potential.[5]

Frequently a distinction is drawn as to the presence of regional, statewide, or nationwide significance. That is, the resource may be of common occurrence, but certain locational, ecologic, or combinations of elements attract a wide sphere of interest to the resources.[6] Bays and estuaries[7] are commonly viewed by resource planners in this way. Coastlines and lakeshores are just now acquiring this image.[8] Entire watersheds,[9] river basins,[10] waterways and air basins,[11] or at least certain aspects of them are frequently assigned special significance.

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[1] *The California Comprehensive Ocean Area Plan* Draft of Dec. 31, 1971. Department of Navigation and Ocean Development, The Resources Agency, State of California.

[2] Odell, Rice, *The Saving of San Francisco Bay*, The Conservation Foundation, Washington D.C., 1972, or *The Quiet Revolution in Land Use Control*, prepared by Fred Bosselman and David Callies for the Council on Environmental Quality, 1972, esp. pp. 108-135.

[3] *Bolinas Lagoon Study*, Conservation Foundation, Washington D.C., 1971.

[4] Classic examples incorporating cultural features may be found in: Philip H. Lewis, *The Outdoor Recreation Plan* (Wisconsin Development Series). Madison: Department of Resource Development, 1966; and *Recreation and Open Space in Illinois*, Univ. of Illinois, Urbana, 1960.

[5] An approach combining a use-suitability approach with land capability constraints may be found in: Gordon A. Bradley, *Land Capability in Recreation Planning for Public Lands: The Tahoe Basin Case*, unpublished master's thesis, Department of Landscape Architecture, University of California, Berkeley, 1972.

Natural processes may acquire significance because of regional images or externalities, e.g., groundwater recharge areas,[12] erosion and sedimentation (Chesapeake Bay), eutrophication (Lake Tahoe), surface hydrology, wildlife migration (Federal waterfowl refuge system), natural plant community succession,[13] or topoclimate. Such presences are important not only in terms of regional interrelationships but in terms of their on-site values as scientific and educational resources.

Areas of natural hazards such as flood plains,[14] seismic damage potential, and geologic instability[15] or brush and forest fire hazard are often considered important, as are induced hazards related to adjacent land uses; e.g., the air traffic hazards and noise corridors of airports, radiation safety zones around nuclear facilities, or explosion hazard zones near ammunition plants and depots.

A new kind of significance is being acquired by areas presumed to have high pollution absorption capacity conferred by absence of urbanization or favorable resource characteristics, e.g., the Four Corners clean-air shed, abandoned salt mines (Michigan), stable geologic strata for deposit of nuclear waste (New Mexico), or soils of high water absorption capacity for urban wastewater management.[16]

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[6] Bosselman, *loc. cit.*

[7] The San Francisco Bay Conservation and Development Commission is probably the best model.

[8] The Wisconsin Shoreland Protection Program, Bosselman, *loc. cit.*

[9] The New England River Basin Commission, for example.

[10] Federal Interagency River Basin Commission.

[11] See: George Hagevik, "Legislating for Air Quality Management," 33 *Law and Contemporary Problems* 275-292. The setting of ambient air standards and the permit systems administered by regional control boards are beginning to have a direct effect on land use, and at least one regional board is overtly involved in land-use planning exercises (San Francisco Bay Regional Air Quality Control Board).

[12] See, especially, McHarg, Ian, and David A. Wallace, "Plan for the Valleys vs. Spectre of Uncontrolled Growth," *Landscape Architecture Quarterly*, Apr. 1965, pp. 179-181; and Ian McHarg, *Design with Nature*, Doubleday, New York, 1969.

[13] *Nicasio: Hidden Valley in Transition*, Marin County Planning Department, San Rafael Calif., 1969.

[14] Luna B. Leopold, *Hydrology for Urban Land Planning–A guidebook on the hydrologic effects of urban land use*, Geological Survey Circular 554, Washington D.C., 1968.

[15] Donald R. Nichols and Catherine C. Campbell (eds.), *Environmental Planning and Geology*, Geologic Survey, USDI, and Office of Research and Technology, HUD, Washington, 1972; see also the pioneer effort: San Francisco Bay Region Environment and Resources Planning Studies by USGS/HUD, 1972.

[16] U.S. Army Engineer District, San Francisco, *Alternatives for Managing Wastewater*, 1971, and "Public Brochure: San Francisco Bay and Sacramento, San Joaquin Delta Water Quality and Waste Disposal Investigation," USAE, San Francisco, Aug. 1972.

Finally, the landscape may be valued for historical sites and places (buildings, trails, archeological sites) or for current cultural and landshaping purposes; e.g., urban expansion, community definition, general scenic amenity, community separation, separation of land-use conflicts, utility ways, and transportation corridors.[17]

Of course, most areas of significance present an array of valued attributes and could meet a number of potential goals. Hence there is a trend toward multiple-use management. Research is needed to assist planners in identifying resource capabilities, on the one hand, and its suitabilities for specific uses, on the other. Policies, plans, and project proposals must then be evaluated in light of this background information. As we see in the next section, however, planning and its contexts are indeed complex and may take many forms.

PLANNING AND ITS CONTEXTS

This section presents something of a typology of planning. If research is to be useful it must be fitted to the planning process, be appropriate in terms of scale, validity, and timeliness, and be readily understood by clients, professionals, and those affected by the planned decision.

Each type or level of planning is discussed here in terms of its objectives, normal range of options, limitations, and information needs.

Site Planning

Classically, site planning is concerned with the arrangement of predefined uses within previously established physical boundaries. Planning is constrained by the client's purposes, financial situation, and time schedule, and options are usually limited to minor adjustments in design concept, land allocation, density of development, and level of investment in engineering works and land management practices.

Data on regional social conditions, infrastructure capacity (schools, water, sewers, roads), and on natural features (e.g., geology, soils, climate, hydrology, vegetation, wildlife, and visual character) should be readily available at county or a higher scale in order to be useful. Inventories in specialized areas should also be accompanied by interpretive studies which relate data to planning targets and constraints.[18]

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[17] For a comprehensive discussion, see: Eckbo, Dean, Austin, and Williams, California Metropolitan Open Space Study, 1965; or Ann Louise Strong, *Open Space for Urban America*, Department of Housing and Urban Development, Washington, 1965.

[18] A basic text here is: Kevin Lynch, *Site Planning*, Cambridge, MIT Press, 1961. Most work in this field is concerned with the importance of site conditions to internal design considerations (i.e., orienting windows to the proper sun angle, avoidance of winds or wet portions of site, etc.); further study is needed in the investigation and representation of the off-site implications of on-site design decisions.

Increasingly, site plans of all sorts are being reviewed by the next higher level in the system. There is also a concomitant need for checklists and interpretive maps which express regional concerns overlapping any given site. Manuals and handbooks are needed so that site planners and developers can be shown how to solve site problems that have serious external effects (e.g., ways to handle storm runoff in order to preclude the need for channelization downstream).[19]

Area or Regional Planning

This term is presently used to denote planning that is area oriented (like site plans) but covers a larger region or subregion, usually with varied resource conditions, a public client, many landowners, varied proposed uses and objectives, and, often, limited power to implement planning recommendations.

Such planning commonly involves a considerable effort in land inventory and evaluation, with emphasis on classification as to suitability (for certain uses) and capability (to withstand environmental impacts).

Whereas in site planning the available data are inevitably too general, in area plans the problem is likely to be that of acquiring, interpreting, and actually using the vast amount of information potentially available. Much information is not relevant to future problems (e.g., geologic maps indicating mineralization rather than engineering properties) but agencies are working to remedy this situation.

As to the types of information used, the following parameters were entered in the computer-assisted information center for the Tahoe regional plan and is a fairly representative mix of available information that is of some value:

Elevation
Slope
Aspect
Geology–Bedrock type
Soil type
Vegetation type
Vegetation species assemblage
Vegetation structure class
Vegetation overstory canopy
Vegetation understory canopy
Vegetation conifer density
Vegetation total density
Annual rainfall
Annual snowpack
Watercourse type
Rank order–Major watercourses
Drainage density
Geomorphic unit
Drainage basin
Drainage density
Channel slope
Hypsometric integral
State boundaries
County boundaries
Community boundaries
Utility districts
Land value–Assessment categories
Landownership–Type-size categories
Land use–Interim Plan
Land use–Existing Generalized Land
Land use–Preliminary General Plan
Land use–Acquisition Plan
Historical sites
Highway and major road alinements
Visual vulnerability

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[19] A prototype for this is the *U.S. Forest Service Manual and Handbook*, a multivolume set of directions, illustrations, recommendations, and model specifications; all are designed to assist managers and field personnel in the actual implementation of policy.

Available information regarding data relevance, validity, and comparability is frequently inadequate and/or misleading, particularly in these areas:

(1) Geologic and soils interpretation (which should be made for specific project types);

(2) Groundwater data and interpretations (inadequate);

(3) Maps and interpretations of natural plant communities (generally inadequate);

(4) Data on climate, interpretive information on topoclimate and microclimate (inadequate or conflicting);

(5) Census data for sparsely settled and urbanizing areas[20] (useless or misleading);

(6) Property records (which are not kept in a form capable of geographic reference);[21]

(7) Standard land-use categories (which bear little relation to their physical engineering attributes and environmental impacts).

Hence it is now virtually impossible to forecast accurately the environmental implications of plans such as a typical county general plan or park master plan.

An exception to this may be found in the Tahoe regional plan, which consists of a land capability map, a land-use plan or general plan, and a set of implementing ordinances. Any proposal must be screened through both maps in order to be approved.[22] Alternative land-use plans may be compared for congruence with the land capability map.

Other problems with the land-use planning aspects of work at this scale concern "master plan" concepts which seek to freeze a given land allocation for long time periods and the practice of exclusionary zoning which allocates land to single purposes (commercial, low-density residential, etc.) instead of providing for multiple use.

Functional Planning

Planning for specific types of uses (recreation, transportation, housing) also impinges on areas of significant value in two important ways:

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[20] Census tracts and enumeration districts are frequently drawn in such a way that they mask geographic variation (in that vast areas of land are included in areas of sparse population); further, disclosure rules prohibit use of disaggregated data for many rural and urbanizing areas. Other problems stem from the seasonal nature of nonurban residents, disparity between home address and voting address, etc.

[21] Many agencies use automatic data processing, but methods are not standardized, data are not in a form which permits inexpensive scanning, and aside from a few instances, data are not spatially organized and cannot be plotted without an arduous interim coding process.

[22] A discussion of this approach may be found in: James Pepper, *An Approach to environmental impact evaluation of land use plans and policies: The Tahoe Basin planning information system*, M.C.P. thesis published by the Department of Landscape Architecture, University of California, Berkeley, May 1972.

(1) Such areas are frequently the target of such special-purpose planning: open space, wilderness, wild rivers, park systems, wildlife, scenic roads and parkways, and estuary and coastline protection.

(2) Plans for nonenvironmental functions impinge upon areas of special significance. For example:
  energy production and transmission, affecting coastline and desert environments;
  sewage treatment facilities;
  interregional water projects (California water plan, Central Arizona Project, North American Water and Power Alliance (NAWAPA)) which have not only large direct effects but significant land-use effects;
  timber resource development, affecting especially sensitive coastal watersheds;
  flood control projects, affecting marshes and estuaries;
  mining, which affects mountain and desert environments especially;
  port development, affecting bays and estuaries.

Traditionally, plans for each separate functional topic have been narrowly conceived and only loosely coordinated with other functional plans impinging on the same area. Each functional planning sector carries out an independent evaluation of project need, costs and benefits, environmental suitability and capability, design and implementation.

The pace of functional planning is often set by external market and political forces. Even the best efforts at "environmentalization" and coordination may be set aside in order to achieve functional goals and deadlines.

Those expected to cooperate in the broadening of a functional plan (as, say, game and fish experts might help in a highway project) are seldom sufficiently funded and staffed to be able to conduct the background research and inventory work necessary for them to participate as equals in decisionmaking processes. Therefore, the sources of functional planning depend in good measure on the prior availability of inventory data and of a rich program of mission-oriented research that is relevant to ongoing functional programs. (It is no accident that the U.S. Forest Service maintains a very large research organization which attempts to keep well ahead of information needs.)

Despite (or perhaps because of) the shortcomings of the function-by-function approach, it remains the dominant form of planning today. A number of avenues which augment this approach are being opened up, however:

1. *Legislative review.*—The virtually complete independence of some single-purpose development systems is being challenged.[23] Consideration (though little action) is now being directed toward the autonomous bonding authority

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[23] In California, for instance, a bill to subject the State highway budget to legislative review failed this year, but by a fairly narrow margin.

vested in special districts (especially the development proposals of municipal water and rural irrigation districts).

2. *Administrative budget review* (U.S. Office of Management and Budget, Governor's offices of finance or planning, county's office of administration).–Such offices increasingly require benefit/cost analyses, project coordination, and rectification of conflicting justification statements (e.g., a proposed road may be justified on the grounds that the service area is expected to urbanize, whereas an irrigation plan may assume an increase in truck farming for the same area).

Another useful task at this level is to investigate, for a proposed development: (*a*) the increment of investment needed to provide minimum adequate service to existing uses, (*b*) the addition of that part of the project which would assume or encourage a measured increment of growth.

3. *Internal agency review and coordination.*–Multipurpose land management agencies such as the U.S. Forest Service and BLM have developed sets of "multiple-use coordinating requirements" to force coordination between parallel functional planning efforts. (In effect, they say: "When planning a timber access road along a stream, don't forget to check with the wildlife planning team so as to avoid disruption of salmon spawning beds; check with the recreation planners to see if the road may also serve a proposed campground, etc.)[24]

The main problem with this system is that environmental information and interpretive skills must be sought out by the functional planners (who are likely to be specialists only in their own field), and if sought out, must be readily available and understandable. If this type of functional planning is to operate effectively in sensitive environmental areas, there would have to be an increase in environmental inventory work, and in the creation of cadres of consultants skilled in the interpretation of scientific information for planning purposes.

4. *Team planning.*–Many functional plans are now conducted by teams of professionals who are expected to represent a wide array of values and environmental and social disciplines. While this has had a broadening effect on the functional plans, there is a residual bias toward the project by the proponent agency. Also, professionalization of varied points of view has led to the use of weighting systems to reflect the significance of scientific findings.[25] The logic and validity of such systems is certainly in need of fresh critique and evaluation.

5. *Functional/area planning.*–This approach attempts to coordinate the functional plans for any given area in order to illuminate economies of scale and conflicts. The expectation is that the "stack" of functional plan overlays

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[24] See generally, Heyman, Ira M., and Robert H. Twiss, "Environmental Management of the Public Lands," *California Law Review*, vol. 58, No. 6, Nov. 1970; and more specifically: "Management Guide, Northern California subregion," *Forest Service Handbook*, USDA, San Francisco, 1970.

[25] For a discussion of the map overlay approach used in the study of I-98, see Ian McHarg, *Design with Nature*, pp. 31-41.

(so to speak) can be rectified against the area's environmental and land-use planning base which is used as a foil. The U.S. Forest Service is now evolving from a functional-planning approach, using "multiple-use coordinating requirements" to resolve conflicts, to one of functional/area planning. In this new type of planning, plans and requirements will be tied to specific units of land. The Army Corps of Engineers are creating general "regional plans" to serve as foils for evaluations of specific projects. The Department of Transportation will assist local governments financially in the creation of area land-use plans so that the transportation element may proceed. In another example, the San Francisco Bay Area Air Pollution Control District is conducting land-use planning studies to illuminate the implications of permit decisions. Improved methods of area planning should take into account:

(1) The identification and delineation of boundaries for multifunction area planning units (e.g., should a Forest Service planning boundary reflect timber type, recreation shed, hydrologic unit, landscape unit, and/or the school district which receives the timber sales receipts?);

(2) The reduction of future flexibility in functional plans and decisions, unless a significant portion of land is "set aside"; and

(3) The lack of information on the spatial effects of policy decisions.

6. *Environmental impact assessment.*–Perhaps the most important response to functional and project planning has been the concept of environmental impact assessment and its administrative vehicle, the environmental impact statement (EIS).

Although normally associated with the National Environmental Policy Act of 1969, the impacting process is now also being employed by some State and county governments (at least in California, Washington, Delaware, Wisconsin, North Carolina, Indiana, and Montana)[26] and some foreign governments (Australia's New South Wales, for example).

It is generally recognized that the EIS is a powerful tool for forecasting (or at least illuminating) potential environmental costs and benefits, for interagency coordination, and for public involvement. The process can at minimum provide for more careful consideration of environmental variables (as in the Trans-Alaskan Pipeline case) or, at best, for major redesign of project goals and characteristics (for example, Tijuana Slough flood control project).[27]

The EIS process, therefore, is critical to sensitive-area management and merits at least a brief comment as to current issues in impact assessment and the concomitant needs for research.

Even a cursory review of present impact statements reveals the serious problems being encountered in describing and justifying the social need for the project.[28] Recommendation Two of the latest Council on Environmental Quality (CEQ) memorandum on procedures for improving impact statements comments on the agencies' ". . . obligation to weigh the possible environmental effects of a proposal against the effects on other public values the agency is mandated to consider."[29] This "implicit requirement" rekindles a concern for the measurement and evaluation of the benefits (market and especially nonmarket in nature) derived from all manner of programs and projects. Of special interest is the incidence of costs and benefits in terms of nationwide, regional, and local effects. Quite commonly, the cost of protecting significant areas falls on local citizens, with the benefits accruing to a regional or nationwide population. Since many projects must be subjected to this kind of analysis, there would seem to be a need for regional social accounts to serve as a foil for program and project evaluation.

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[26] Conservation Foundation Newsletter, May 1972.

[27] U.S. Army Engineer District, Los Angeles. Tijuana River Flood Control Project, San Diego County, Calif., draft, Environmental Impact Statement, Apr. 1971.

A related problem arises in the form of agency bias, which can be reflected in the statements' evaluation of costs and benefits. (In at least one instance, the consulting firm which would receive the project design and construction contract has also prepared the material for the EIS.) Research would be of value in the setting of objective standards of reportage and evaluation and perhaps in the testing out of third-party review and evaluation schemes. The role of the public university in this regard should be explored (Hawaii's experience with a Governor's advisory committee would serve as a starting point).

In a more technical vein, evaluators are experiencing difficulty in expressing the dimensions of environmental quality that are subject to impact. Research is needed on indicators of environmental health and stability, and especially a search must be made for indicators which relate to the concepts of environmental "significance" treated in the section of this paper entitled: Targets for Planning; Concepts of Significance.

Impacts must be considered not only in a direct sense (as a road cut induces soil erosion) but in terms of the ecological chain of events (as the soil erosion caused by a road cut clogs a salmon spawning bed). There is, therefore, a need for research on the identification and management of sensitive environments. Basic descriptive studies are in order, but attention must focus on the response of such ecosystems to stress and change (a more advanced task). Work must also include ways of representing key interrelationships. The network analysis on dredging and the marine ecosystem is a classic example here.[30]

In response to planners' needs for coping with diffuse impacts, Sorensen and others are developing stepped matrices and networks which permit the tracing-out of chains of interaction between land uses, projects, ecosystem effects, and feedback events.[31]

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[28] For an example of a weak "need" statement, see "Davis-Besse Nuclear Power Station," U.S. Atomic Energy Commission, draft of Nov. 1970.

[29] "Council of Environmental Quality Memorandum to Federal Agencies on Procedures for Improving Environmental Impact Statements," *Environment Reporter*, June 1972.

[30] Traveler's Research Corporation, *The Classification of Marine Resource Problems–Step I* for the Nassau-Suffolk Regional Planning Board, 1969.

Decisions as to the degree of impact likely to occur when a specific project component interacts with a specific environment are always a matter of professional judgment. Further research is needed on this decision process and for ways of representing the conclusions reached. Leopold's approach to representing both the "magnitude" and "importance" of impact in a matrix format is a case in point and deserves refinement.[32]

Impact statements have become a key vehicle for alerting and involving the interested public, although their primary intent is that of agency coordination. This has had the good effect of illuminating the decision process, but has also caused delays and misunderstandings. Mechanisms of public involvement (circulation of declarations of intent, public meetings, hearings) are much in need of research. The U.S. Army Engineers' (Seattle office) process of semitechnical work sessions and the preparation of a public brochure now sets a standard in this field.[33]

Finally, the process of impact statement review by responsible agencies and clearinghouses raises a new set of research needs. Due to constraints in budget, personnel, and time, the reviewing/commenting agency has special problems. Too often remarks are highly perfunctory, unless public interest and controversy accompany project review. Agencies with broad missions (e.g., EPA) or expertise in a commonly impacted environmental field (e.g., Sport Fisheries and Wildlife), or broad review responsibilities (a Governor's office or Council of Governments (COG), must screen and manage literally hundreds of statements a year.

Such clients are badly in need of checklists to cover project characteristics and environmental variables, a means to provide geographic control and some method of indicating the potential for multiple impacts which arise from seemingly unrelated projects.[34]

OUTLINE OF CURRENT RESEARCH APPROACHES

The problems of identification, management, and protection of sensitive areas are certainly not new, and there are programs of research already underway. This research effort is small and scattered, but since some studies are landmarks and others have begun a considerable amount of exploratory and methodological work, a few brief comments on current work are in order.

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[31] Sorensen, Jens, *Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone*, M.L.A. thesis published by the Department of Landscape Architecture, University of California, Berkeley, 1971.

[32] Leopold, Luna, *A procedure for evaluating environmental impact*, Geological Survey Circular No. 645, Washington, 1971.

[33] Seattle District, U.S. Army Corps of Engineers. *Public Brochure – Alternatives and their pros and cons – Small boat harbors, Seattle Harbor, Elliott Bay, Seattle, Washington.* Second draft, Apr. 14, 1971.

[34] Sorensen, Jens, and James Pepper, *A procedure for regional clearing-house review of environmental impact statements*, prepared for the Association of Bay Area Governments, 1972.

Much of today's research stems from the wave of interest in outdoor recreation (e.g., the Outdoor Recreation Resources Review Commission (ORRRC) studies and the U.S. Forest Service's Forest Recreation Research Projects) begun in the late 1950's. Other interests stem from the interest in the work/leisure dichotomy (also in the 1960's). Little was done on visual and esthetic dimensions until the "natural beauty" movement envisaged by Lady Bird and the Johnson administration. The early 1960's also saw a resurgence of interest in rural area development and studies of the economics of recreation, tourism, and open space. "Open space" as a popular concept came into its own later and seemed to direct attention into legal and administrative research.

These waves of interest from various directions, including, we hope, some more spontaneous sources, have given rise to a wide spectrum of research:

(1) A number of social scientists are looking at the links between man and his natural or outdoor environment. These include studies of human perception in a psychological sense,[35] [36] and behavior of individuals and family groups in forest recreation sites,[37] wilderness areas,[38] and resource management areas;[39]

(2) Visual resources are being inventoried,[40] [41] evaluated and planned.[42] "Seen-area" computations and maps can be produced by hand (as above) or by computer,[43] or both;[44]

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[35] Craik, Kenneth, "Human Responsiveness to Landscape," *Student publication of the School of Design, North Carolina State University,* Raleigh, 1968; or "The comprehension of the everyday physical environment," *Journal of the American Institute of Planners,* Jan. 1968.

[36] Coughlin, Robert, and Karen Goldstein, "The extent of agreement among observers on environmental attractiveness," Discussion Paper 37, Regional Science Research Institute, Philadelphia, 1970.

[37] Burch, William, "The Play World of Camping: Research into the Social meaning of outdoor recreation," *The American Journal of Sociology,* vol. LXX, No. 5, Mar. 1965.

[38] Lucas, Robert C., "The contribution of environmental research to wilderness policy decisions," *Journal of Social Issues,* vol. 22, No. 4, pp. 116-126.

[39] Twiss, Robert, and R. B. Litton, "Research on forest environmental design," *Proc. Soc. Am. Foresters, Annual Meeting,* Seattle, 1966.

[40] Litton, R. Burton, *Forest Landscape Description and Inventories,* U.S. Forest Service Research Paper PSW-49, 1968.

[41] Jacobs, Peter, and Douglas Way, *Visual Analysis of Landscape Development,* Graduate School of Design, Harvard, Cambridge, 1969.

[42] Zube, Ervin, *An inventory and interpretation of selected resources of the island of Nantucket,* Amherst, Mass., Coop. Extension Service and USDA, 1966.

[43] Elsner, Gary, *Computing visible areas from proposed recreation developments . . . a case study,* USDA Forest Service Research Note PSW-246, 1971, 10 pp.

[44] A comparative evaluation of computer and hand methods was conducted for a portion of the Teton National Forest. The computer approach added accuracy, at a cost.

(3) Visual and esthetic dimensions are being investigated for the urban scene[45] and for transportation environments,[46] where some major environmental simulation studies are in progress;

(4) Planning projects are frequently a vehicle for applied research by those engaged in advanced professional work and teaching, and in some instances are serving (more than formal research programs) to advance the field.[47] An effort to apply "Big Science" to environmental planning is underway at Oak Ridge National Laboratory[48] and other Federal laboratories;

(5) Studies of the physical and natural environment include inventories,[49] [50] natural systems studies,[51] and natural/engineering/economic systems studies.[52] Others focus on the interpretation of scientific information for planning purposes and the "carrying capacity" of environment in terms of its ability to support given uses.[53] [54]

This is hardly an inclusive listing, but the point should be made that there are few totally new areas of research. Many new and expanded areas of study are vital and critically in need of support; but new efforts should be linked to current work, such as it is.

STRATEGIES FOR RESEARCH

Information needs are so numerous and varied that it is hardly possible to devise a complete catalog. This section, therefore, merely suggests a number of ways of describing the research-need "elephant," so as to cover the more salient issues deserving of research and point up some key questions of research policy.

Research Aimed at the Various Levels of Planning

If one accepts a client-oriented framework for research, the foci can be the key decision points in terms of jurisdiction and scale.

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[45] Lynch, Kevin, *Image of the City*, Cambridge, MIT Press, 1960.

[46] Appleyard, Donald, et al., *The View from the Road*, Cambridge, MIT Press, 1965.

[47] McHarg, Zube, *supra*.

[48] Meyers, Charles, *Regional Modeling Abstracts*, Oak Ridge National Laboratory, 1971.

[49] Stewart, C. A. (ed.), *Land Evaluation*, Macmillan of Australia, 1970.

[50] Hills, Angus, *The ecological basis for land-use planning*, Ontario Department of Lands and Forests Research Report No. 46, 1961.

[51] Watt, K. E. F., *Ecology and Resource Management*, McGraw-Hill, 1968.

[52] Isard, Walter, et al., *Regional science and landscape analysis project*, report to ESSA, 1967.

[53] Magill, Arthur W., *An evaluation of campground conditions and needs for research*, U.S. Forest Service Research Note PSW-4, 1963.

[54] Wagar, J. Alan, *The carrying capacity of wild lands for recreation*, Forest Science Monograph, 7, 1964.

The growing realization that many environmental concerns are global in nature will have some direct effects on sensitive-area planning in the United States. For example, were we to meet our energy requirements with less reliance on imports, there could be increased pressure for offshore-oil extraction, and strip mining of coal in the southwestern and southeastern United States. There are a host of issues at the international level with more or less direct implications, and certainly some policy and planning research should be forthcoming (the minimum should be a review of the Stockholm recommendations from the point of view of land-use planning in the United States).

At the national level, there is a need for research support as well. Some topics might be:

(1) Coordination of Federal research programs in support of land planning (USGS, SCS, USFS, HUD, NPS, BOR, and NASA, for instance, each have programs of direct interest to sensitive-area management and planning, but to date there is little coordination and no user-oriented research dissemination facility).

(2) Federal/State/local interactions are critical to better land-use planning in, for example, desert environments (BLM/local), forest areas (USFS, BLM/local), park influence areas (NPS/local), and the coastal zone (BLM, USGS/State/local). This field is filled with token coordinative arrangements and virtually devoid of binding agreements.

At the State level, attention focuses on proposed land-use planning bills and the hoped-for emergence of the State as a strong force in land planning. While there are some signs of activity (Hawaii, for instance), it is clear that any solid planning program would benefit from research support. The State outdoor recreation plans, with few exceptions, fell short of expectations. Perhaps research and consulting support on study designs, standards for data acquisition and reporting, and similar procedural aids would be most helpful at this point in time. Of specific interest at this level would be sets of model planning criteria and guidelines for local governments' handling of sensitive environments of statewide interest.

Planning at the local level has received at least some attention from foundations and research institutions and research might best be aimed at the *level* of regional government, even though there may be no single planning and decision point at that level.

Research on the Processes of Planning

Given the wide range of planning issues, levels, and types, it might also be most effective to try to increase the efficiency of planning procedures and tasks that are already in common use. For example:

Land inventory
Land capability evaluation

Data acquisition, storage, handling
Research interpretation
Environmental impact assessment
Public involvement (strategies could be investigated in terms of purpose, method and relative efficiency).

Attention also might be directed to the concept of "planning support systems" or alternative forms of organizing planning and research functions.

Research Targeted at Issues in Environmental Planning

This approach is necessarily loose conceptually, but has the advantage of engaging topics with practical value.

Some obvious candidates might be:

Coastline and estuary management
The mountain transition zone (Mid-Sierra, Rocky Mountains)
The identification of unique or prototypical environments
The promotion of resource and energy conserving life styles
Strategies for the management of the growth of population and urbanization
The role of functional and project planning in urban development
The economic costs (in terms of jobs or tax base) of environmental policies and plans
The linkages between public health planning and land-use planning, especially air and water quality standards and other tradeoffs between environmental goals.

It would be helpful if issue-oriented research would include at least one of the other dimensions discussed earlier. That is, the issue should be studied at several "levels" of planning in a comparative set of case studies or in terms of alternative methodologies.

Research According to Academic Discipline

Mission-oriented research inevitably entails a matching of specialized disciplines to a given, applied problem. Research management is a problem even for mission-oriented agencies such as the U.S. Forest Service and USGS. The degree to which universities can help State and local governments in a direct way is still an open question. The problems of multidiscipline and interdisciplinary research are not new and perhaps the need here is for research on alternative approaches to university/planner cooperation.

If one comment is to be made in closing, it is that future research could, of course, benefit from bold new programs. But we must also stress the need for redirection of existing lines of research toward some old problems that now are taking on a new significance.

Chapter 11

UNIVERSITY RESEARCH AND PRACTICE: AN INSTITUTIONAL CONFRONTATION

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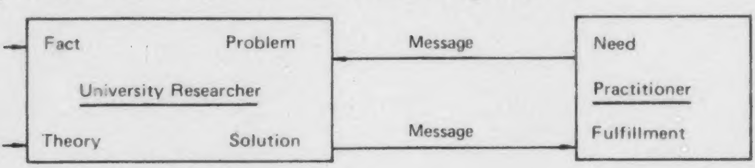
This paper is concerned with the role of universities and their research organizations in contributing research insights into the problems of planning for our physical environments. It is based on a long series of interviews on the knowledge-transfer process that is now taking place between universities and land-use and environmental planning agencies. It quickly became clear, as we discussed the knowledge utilization process with practitioners and researchers, that the world of university research is quite distinctly separate from that of the environmental management agencies. Communication between these worlds is impoverished and is characterized by a great deal of mutual disrespect.

The university researcher is likely to think of the practitioner as being something of an intellectual washout. As one put it: "If they had anything going for them, they wouldn't be where they are." On the other hand, the practitioners have virtually ceased to expect anything worthwhile or useful to emerge from university research. "They come in here and start pontificating, and we know in a minute that we're not going to get anything out of them."

Our intended study of the knowledge utilization process quickly became transformed into an exploration of the features of the separate worlds of researchers and practitioners that detract from their effective communication. Although our interviews were restricted to the larger planning agencies and universities in California, we believe that the overall uniformity of our findings suggests that the situation we describe is typical of relations between researchers and practitioners in other sections of the Nation.

Somewhere there may exist a relationship between university researcher and practitioner client where information flows as diagramed:



In the diagram (adapted from Havelock and Benne)[1] a "need" expressed by the practitioner is transformed into a research problem by the researcher and, after suitable admixtures of fact and theory, a solution is transmitted backward through the system resulting in "fulfillment." This theoretical construct seems rarely to fit the actual situation. (There are also deficiencies in facts, data, theory, and researcher skills that damage the knowledge utilization process.)

It is our conviction that any moves toward changing the communication structure between university researcher and practitioner should be founded on an understanding of how these institutions are now functioning. We do not view the current patterns of impoverished communication as a "mistake" that will be joyfully corrected the moment it is identified. On the contrary, we view the present communication system as being well adapted to the internal institutional needs of both researchers and practitioners. In other words, lack of communication between practitioners and researchers may have a positive value in maintaining the individual organizational cultures of both groups. If this is the case, the job of getting universities to provide research work that can be more effectively applied to the solution of urban/environmental problems will necessarily involve significant effort and determination. It might be expected that both the practitioner and university groups will actively resist efforts to bring about substantial changes.

Although there is a conventional presumption that university researchers are eager to apply themselves to problems of social consequence and that environmental/land-use planners are equally eager to receive solutions, a cursory examination of the institutions surrounding these actors reveals that there are powerful constraints inhibiting such a union of efforts. On one hand, the university system maintains an institutionalized reward system that places little or negative value on pragmatic community problem solving.

In conducting our interviews for this study, we discovered almost without exception that the most active university-based agents in community problem solution were least likely to hold secure academic appointments. But when we look at the institutions charged with regulating the environment, we discover that "solutions" for most of the issues that we think of in environmental/land-use problems are already in place and elaborately institutionalized. While there may be interest in technical inventions that can simplify, speed, improve, or glamorize current practices, there is little welcome for ideas that would disturb the organizational integrity of government. The institutional structure of both universities and Government acts to constrict the potential transfer of communication and the range of alternatives for public action.

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[1] Havelock, Ronald G., and Benne, Kenneth D.: "An Exploratory Study of Knowledge Utilization," in *The Planning of Change*, Bennis, Benne, and Chin (eds.). New York: Holt, Rinehart & Winston, Inc., 1969.

SPECIAL NATURE OF ENVIRONMENTAL PROBLEMS

Value Conflicts

The words "environmental problems" are often employed to describe situations that amount to disputes between metropolitan residents. "Pollution problems" refer to disputes between polluters and neighbors; "race problems" to disputes between minorities and majorities; and so forth. Even the perception of a problem is a matter open to dispute: How many crimes form a crime wave? How much open space is adequate? What is the proper rate of urban growth? Such "problems" are, in part, defined by the value conflicts they and the political squabbles they generate.

Academic research is often viewed as transcending partisanship, as an unfettered search for a unique truth. Objectivity and the symbols of objectivity are highly valued, and subjectivity and emotionality are not. Although this model for research has functioned for the physical sciences, it has created grave problems for the social scientist who would concern himself with matters of public controversy.

University researchers have attempted to circumvent the realm of value conflict in a number of ways. One way to avoid confrontation with all questions of values is to exclude from the research all problems which are value laden. While the research thus produced may be "untainted," it may also be incomplete and partial. A second way to avoid recognition of the value issue is to assume that only the values of the researcher or his clients are relevant to the problem solution. A third form of avoidance (which may be considered a special case of the second point) is the acceptance of "standards" as facts. While this can free the researcher from involvement with epistemological issues, it can also act as a blinder to the realization that in many cases "standards" are simply value statements called by another name. Recently it has become popular among some academic researchers to compose alternative "solutions," scenarios, plans, or whatever in response to alternative value constructs. While this allows various values to be explicitly treated and protects the researcher from accusations of partnership, it does not result in solutions—only better articulated problems. The client group may be left saying, "But what should we do?"

Even though the development of techniques for negotiation and resolution of value differences has been the subject of university research, notably in subject areas of industrial relations and in the applied behavioral sciences, the products of this work are rarely applied to the resolution of community problems. There is probably one central reason that conflict management techniques developed in private industry are unmarketable to public agencies. It is that an alternate resolution strategy has been institutionalized in the form of the elective process and a hierarchical structure of administration. While Government, through visible decisions of elected leaders, may represent a workable mode of conflict resolution, it does not represent the only possible technique or the most effective strategy for dealing with certain types of issues. Many of the values and procedures built into governmental structure are substantially in conflict with the new techniques for organizational management which are being developed through applied behavioral science.[2]

Clients

Another difficulty inherent in the study of environmental problems is the *identification of the appropriate client group.* Martin Krieger writes that ambiguity in identifying the client is a major problem confronting research institutes seeking funding.[3] If the institute is looking to a variety of funding sources, it runs the risk of alienating potential sources if it adopts one client's viewpoint. Also, identification with a particular view can lessen in other circles the credibility of the researchers. To complicate this problem further, the researcher may have a public agency as a client, but he is also responsible to the academic community and must produce a product acceptable to them.

Test-Tube Solutions

The desire to study environmental problems in a "laboratory" experiment is another obstacle to the conduct of effective research. Problems arise out of a "turbulent" environment that deviates from the laboratory model of problem solution. It is virtually impossible to extract such problems from their settings and move them to a more tranquil, controlled location for study and solution. Separation of the researcher from the locus of the problem can dull his appreciation of the transitions and changes that characterize the experiencing of a dynamic social issue. Environmental problems rarely maintain a consistent structure over an extended period of time.

Another drawback to the laboratory approach to environmental problem solving is that solutions are frequently delivered as a single unit–there is no breakdown in terms of priorities or time planning. Typically, little thought has been given to operational issues. If the agency has only half the budget originally expected, or if the political climate is such that only a limited program will be accepted, the research might become useless. We must have a solution that could be incrementally implemented and adapted to specific time-money constraints. This difficulty arises out of a familiar situation which isolates the researchers from the constraints operating on the system and does not allow for periodic evaluation or feedback. The problem has been recognized by the Department of Labor in a series of seminars which identified the transfer of demonstrations from nurtured to nonnurtured environments as one of the most critical problems inhibiting the use of universities as problem-solving resources.[4]

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[2] Eddy, William B., and Saunders, Robert J.: "Applied Behavioral Science in Urban Administration," *Public Administration Review*, vol. 32, No. 1, Jan.-Feb. 1972. U.S. Department of Labor.

[3] Krieger, Martin: *Thoughts on Thinkeries*, Working Paper No. 117, Center for Planning and Development Research, University of California, Berkeley.

Commitment

Of great importance is the relative lack of significant societal commitment to the solution of the environmental problems. Most of the problems we experience are obverse aspects of things enjoyed by members of an affluent majority. We enjoy the natural resources we consume, the gardens around our homes, the neighbors who share our values, our individual auto(s) parked a few steps away. Much of what we classify as urban problems are the unintentional outcomes of positively valued public activities. It will be necessary to curtail rights, cut back on pleasures, or restrain enjoyment in order to solve some of the problems. Because such actions would be unpopular, the problems remain unsolved.

While it is fairly easy to gather commitment to a problem that occurs all at once, such as a flood or an earthquake (especially when there is no "blame"), it is far more difficult to direct public action against something that occurs in gradual increments such as air and water pollution or diminishing open space. Many urban issues are of this gradual-growing variety.

INSTITUTIONAL DIFFERENCES

The conclusion that there is low interpersonal regard between practitioners and academic researchers is unavoidable. The slanderous statements quoted in the "Introduction" are typical comments. For messages to be believed, or even received, there must be a feeling of trust between communicators. There are other requisites of good communications, but it is clear that this basic proposition is rarely satisfied. While practitioners and academics admit that there are a few "good" men in the other camp, they view them as rarities. Although one might argue that different people would be attracted to careers in universities than those in Government, and that this could explain difficulties in communication, we prefer an alternative explanation. We feel that the role assignments dealt out by the respective institutional systems are sufficient to require behavior in one group that appears "irresponsible" or "irrelevant" to members of the other group.

Time

One of the crispest examples of this is in the different institutional attitudes toward time. The academic is charged with producing accurate work without reference to budget or time. As one researcher flatly put it, "perfection is our business." The practitioner, by contrast, can accept the task of "doing the best he can between now and next Tuesday." A timely but incomplete research report produced by a practitioner will be harshly judged by the academic community. To the practitioner working with academics it appears that the university groups "do not know how to meet a deadline."

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[4] *Putting Research, Experimental and Demonstration Findings to Use*, November 28-29, 1966. Office of Manpower Policy, Evaluation and Research, Manpower Administration.

The knowledge utilization diagram presented previously shows one "box," the practitioners, where the essential task is to link "need" with "fulfillment"; within such a system speed might be valued more than precision. In the university researcher's box the essential task is to tie up "problems," "facts," "theories," and "solutions"; here precision might be valued over speed. If we subtract the communication linkages from the diagram, we approach the reality of the present situation. On one hand, there is problem "solution" without benefit of university knowledge and, on the other, research without linkage to "need."

The Publication Ethic and Communication

The publish-or-perish doctrine which is so central to the university reward structure creates almost insurmountable difficulties for the academic researcher interested in practitioner problems. The job insecurity that seems to characterize the academics who are currently most active in working with practitioner and community groups is not accidental. The time devoted to working on practitioner-related research is likely to be viewed as "bad time" by tenure and promotion committees. Any time spent in the employ of agencies working on environmental problems is rarely counted toward academic advancement. Work done in teams which seems an appropriate way of researching the multifaceted environmental issues is downgraded. Joint publication counts much less than individual authorship. "Case studies" are viewed as low-level scholarship. The academic repute of publications is also a factor included in the weighing of a publication record. The authorship of a report prepared for a practitioner client, or a publication that is published by a commercial consultant or governmental agency—however influential, original, or widely distributed—is unlikely to be given any weight in determining academic promotions.

Practitioners do not read the journals related to urban and environmental planning. One describes them as "redundant and out of date." Probably a good bit of the redundancy is the result of academics who milk a bit of research into multiple articles in order to swell their publication records. Another source of redundancy is the tendency of editorial boards to publish their own works or those of their colleagues. The publication process takes time and there is a considerable backlog of articles awaiting publication in the more prestigious journals. On the other hand, learning new material is difficult work and there are few extrinsic rewards for the practitioner who maintains a state-of-the-art command of technique and theory. Consequently he falls behind in his reading and, as he does, new articles and ideas become increasingly difficult to assimilate. The articles become "too technical."

One extremely significant means of practitioner communication is through visits by consultants on promotional trips. Over a free lunch the practitioner is given news of technological innovations and gossip about the projects of his fellow practitioners. Just as a study of knowledge transmission in the medical profession showed that pharmaceutical salesmen were a more important source of a current information than the journals, we have discovered that the brushbeaters for consulting firms are an important source of state-of-the-art information for planning practitioners.

It is clear that both academic groups and practitioners today rely upon other communication technologies than journals for information on their central areas of concern. Academics have a well-developed conference system. Communications that connect groups working on similar problems are instantaneous, multiperspective, and interactive. By "instantaneous" we mean the "instantaneousness" of a phone call or face-to-face meeting. By "multiperspective" we mean that the sources of information about any new idea are multiple, and by "interactive" we mean that the recipient is able to ask questions. Since the personality of the communicator is exposed, the practitioner can make judgments about veracity or prejudices of his source. Journals tend to be the opposite of this; delayed, single perspective (except when discussant remarks are presented) and noninteractive.

Practitioner Innovation

New ideas often challenge accepted practices. There is little in the civil service reward system that acts to encourage innovation within public agencies. As George Washington Plunkitt, sage of Tammany Hall, once commented, "no one was ever removed from public office for doing too little." Durability and patience seem to be the main virtues rewarded by the promotional systems of public agencies. The stream of newly trained graduates of university programs is surely one of the strongest forces for technological innovation within public agencies, but this serves as only a partial "bridging" device.

Academic and Practitioner Specialization

Issues that are included in the collection of environmental impacts are especially broad and diverse. They include *subjects that cut across a variety of academic specializations* covering both the physical and the social sciences. Although departments of "urban affairs" or "urban studies" may fit fairly well against the matrix of issues that are termed "urban problems," most university specializations are more narrowly defined. One basic issue in matching university research against environmental problems is that there is probably only a small portion of any single academic specialization applicable to urban issues and the part that fits does not often cover much of the problem.

The boundaries of agencies dealing with land-use and environmental issues, however, are also apt to be poorly organized for a systematic treatment of environmental issues. Fragmented by geographical divisions and by tortuous interweavings of responsibility among local, regional, State, and Federal agencies, public agencies are further divided according to functional specializations (planning, public works, water, streets and traffic, etc.). The structuring of suitable fit of academic specializations, responsible governmental agencies, and environmental problems is an imposing organizational task.

School Years, Project Years, and Fiscal Years

The university researcher is tied to a quarter/semester/term system which establishes a rhythm for research efforts that is disruptive to the formation of close working relationships with public agencies. This takes the form of a force for research closures in segments corresponding to the classroom cycle. Within Government research, "cycles" are linked to a yearly budgeting process. Either the years begin and end with a fiscal year or they begin randomly at whatever time a study grant is awarded by a reviewing agency. July begins the fiscal year for most governmental agencies, which means that the "distractions" of budget preparation, review, and program reorganizations occur at a time when the greatest amount of research power is potentially available from universities.

Regularities and Anomalies

Theories in the social sciences are demonstrably imperfect. In quantitative tests it is not unusual to discover that mathematical models based on accepted theories "explain" less than half of the variation in the phenomena they are meant to describe. Some social science models prove only marginally better than random guesses. One way to look at social environment phenomena is to distinguish two components to each problem: one portion that is capable of explanation through social science theory and a second component that is idiosyncratic and not explainable by generalized theory.

The university specializes in generalizations. The goal of much social science research is to extend the boundary of generalized theory into the realm of the idiosyncratic. By contrast, the practitioner is rooted to the particular. To him the personalities of public officials, the accidents of geography and human history, and the significance of individual acts are centrally important. Sometimes institutional encapsulation makes it difficult for academics to appreciate the power of the idiosyncratic, or for practitioners to appreciate the value of general theory.

A good deal of practitioner-researcher dissention comes from the difficulties that surround the fitting of theory to individual situations. Many practitioner groups have supported efforts to apply social science models. Given the nature of most theory it is unlikely that the generalized will fit any given situation precisely. The practitioner discovers, often in midstudy and with consternation, that the theory he attempts to employ does "not work." Too often the results of such a confrontation between the theoretical and the idiosyncratic result in a defensive retreat instead of a starting place for theoretical improvement. The practitioner retreats to more "tried and true" techniques in an attempt to meet his deadlines and the academic researcher, his theory threatened, dismisses the anomalies as inconsequential accidents.

Perhaps because of their concentration on phenomena subject to generalization or because of the institutional setting which inhibits collaboration with practitioners, academic groups find it hard to deal with the operational issues that accompany the implementation of innovative ideas; within Government the piloting of such ideas through a minefield of interest groups is a demanding activity that requires considerable bravery, skill, and artistry. Too often inventive research reports from academics move directly from the printer to the library shelf because not enough attention is paid to implementation.

Communication Irritants

Practitioners find themselves periodically deluged with students searching for data related to university assignments. As a "public servant," a practitioner is expected to provide to university projects time, data, and occasionally supervision and office space. Although some university instructors are careful to coordinate their assignments with the schedules of practitioners, others are not. Academics, on the other hand, receive numerous invitations to chair meetings or to act as unpaid technical advisers for practitioner groups. In some cases these invitations represent attempts to decorate the ambitions of a particular faction with the credentials of the academic. The error that is made in both cases is that, because of his position, an academic/practitioner can be expected to produce free services for a practitioner/academic without regard for personal considerations or costs.

A source of irritation for practitioners, mentioned in a number of our interviews, is the lack of interest that some academic researchers have in the substance of data files they have solicited from practitioners. While some of this resentment may stem from the "parental overprotectiveness" of primary data collectors, it also appears that some researchers have adopted an ostrichlike position when confronted by the frailties of environmental data.

Practitioner Problems Are Dull

This enumeration of communication difficulties would not be complete without stating that it seems to be a widely shared belief among academics that the problems most governmental planning agencies experience are basically dull and not worthy of researcher interest. The classic description of bureaucratic evolution suggests that the forces that lead toward institutional efficiency (specialization of task, standardization of performance, uniformity of practices, etc.) also lead to rigidity and an inability to cope with changes in the outside environment.[5] The practice of conventional land-use planning seems to have passed into this state of institutional fossilization. The "now" concerns of urban development, the state of the environment, the provision and location of low-income housing, the relation of central city to suburb, *population control*, the creation of new urban centers, and community control issues are not normally the concerns of typical city planning departments. Instead, a multitude of new institutions are emerging to deal with problems outside the bounds of institutionalized city planning: public housing corporations, regional special-purpose districts, environmental protection organizations, and so forth. It is here where there is excitement and an inducement to innovation.

It is not uncommon to find university groups in open conflict with city planning and urban renewal agencies based on the belief that the projects of such agencies are narrowly conceived, limited to serving "establishment" needs and therefore damaging to the urban community.

On the other hand, there seem to be some elements of faddism present in this rush to embrace new institutions and scorn the old. It is apparent that the new organizations will ultimately confront some of the same puzzles that have confounded established organizations and that the same "laws" of bureaucratic encapsulation will enventually dull their appetites for innovation and experimentation. Also, the old organizations have captured and securely held onto many of the powers and activities that are most influential in shaping the environment (such as land-use controls).

ENVIRONMENTAL RESEARCH WITHOUT UNIVERSITY INVOLVEMENT

Although every planning agency we contacted had some association with university life, these relationships were relatively unrelated to an agency's overall research program. Given our enumeration of difficulties in linking up with academic researchers, this outcome should not be surprising. The bar chart below suggests an impressionistic division of total research responsibilities of an "average" planning agency.

Total Agency Research Activity

conducted by agency's staff	borrowed from other agencies	done by consultant	promoters	universities	all others

In every agency the most important source of what the practitioner terms "research" is the agency's own staff. Other significant amounts of research are adapted from other agencies or prepared under contract by consultants. There is a hazy line between consultants and university-based researchers, so we adopted the criterion of profit taking as the distinguishing feature. In every agency surveyed we discovered that the staff was linked to product development schemes for local industries who were trying to expand into the environmental problems field. Commercial firms often find it advantageous to offer free services to local agencies so that they can develop a marketable service. Innovative projects in such diverse subjects as solid-waste disposal, mass transit, and computer display were being developed in this manner.

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[5] This transformation is discussed in ch. 4, "Development of Organizational Structure," pp. 71-109, in Daniel Katz and Robert L. Kahn, *The Social Psychology of Organizations*, New York: John Wiley & Sons, Inc., 1966.

BRIDGE ACROSS THE "GAP"

There are benefits in separating research from practice. Because this paper is concerned primarily with the relationships between university and practitioner groups that might lead to increased "applied" research, the merits of organizational separation have been downplayed. It is notable that within industrial organizations it has often proved beneficial to separate research functions from operations. In many cases industrial research activities are located in "research parks" physically separated from production facilities. It seems that buffering from daily affairs is helpful to the higher flights of intellect and creativity is helpful. We also acknowledge that the teaching mission of a university may be more important than its research mission. Our concern here, however, is with the production of university-based research that has greater present-day value in dealing with environmental problems. It appears to us that the organizational gap separating university research from the practitioner is much greater than it should be if good research and good practice are to be sustained.

One way of bridging the organizational barriers between the universities and the practitoners is to create a bridging organization. A model that comes to mind is that of the agricultural extension activities of the land-grant colleges, which helped transform the practice of farming. Similar "environmental planning extensions" might be created.

This idea is not new. Before World War I, university bureaus and institutes for Government research were established through the leadership of mid-western colleges "to secure and convey information to decision-makers for public policy and management purposes."[6] This was an era in which there was great faith in the promise of a scientific approach to management and the objective (as opposed to the "political") approach to public administration. Between World War I and World War II, the number of bureaus increased, with study emphasis gradually shifting from concern for local government to interest in national affairs. During the same period the activities of the bureaus became stereotyped and the production of regular reports on population or economic activity became a central concern. Today the importance of these experimental bridging institutions has all but evaporated. The bureaus had become confined into narrowly defined roles and had not adopted the newer methodologies of social science research. These were being pioneered by the new social science institutes, such as the Institute of Social Research at Michigan or the Institute of Applied Social Research at Columbia. Funding support and intellectual excitement vanished.

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[6] Waldo, Dwight (ed.): *The Research Function of University Bureaus and Institutes for Government Related Research*, Bureau of Public Administration, UCB Conference, Sept. 17-28, 1959.

The history of these early university bureaus of governmental research closely follows the model set forth by Krieger in describing "thinkeries." In their "first period" they concentrate on raising funds and defining problem areas and new fields of research. In the following period, which may last 5 to 10 years, they generate a large amount of high-quality research which is directed at these problems. The "thinkery" then passes into a "period of maturity," when the most creative people move on and the power of the organizational atrophies.

The university-based institute is still a popular device for bridging the gap between pure and applied research. A complex array of research institutes are appended to major universities and many are willing to undertake work in governmental studies. Often there are a number of institutes on a single campus competing for assignments in "solving urban problems." The popularity of such institutes with academics and funding groups suggests that this is a workable model for knowledge utilization, even though individual institutes seem "perishable" over time.

We are concerned, though, that local practitioner groups rarely buy research from the institutes. Instead, much "applied" research is sponsored by national foundations or Federal-level agencies whose grant review panels are largely composed of academics. In such cases little "bridging" appears to be taking place. In conducting our interviews we encountered several instances where practitioners were rebuffed in their attempts to get information from university groups working on foundation-sponsored projects. Such projects had the stated goal of improving the practice of urban and environmental planning.

When the practitioner seeks help on research problems, he generally turns toward commercial consultants. A study of the sources of scientific and technological advice for governments showed consulting firms as the most important outside source of information.[7] Even though this is a major source of science, the report concludes that "a prevalent feeling is that the small cities and even some large ones do not have technically qualified staff members who can serve to check the specialized services rendered by the consultants." In our interviews we asked practitioners to list recent consulting contracts and to comment on the value of work they performed. About half of the contracts were performed satisfactorily. Curiously, the very best and the very worst jobs had often been done by university-based groups.

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[7] Cape, William: *Scientific and Technological Advice for Kansas Governments and Industry.* Lawrence, Kans.: University of Kansas Publications, Governmental Research Series 38.

MATCHING RESEARCH TO NEEDS

The following discussion is intended to suggest strategies that might be pursued by a funding agency in promoting institutional modifications that could encourage closer collaboration between university researchers and practitioner groups (or other community-based organizations).

It seems obvious that the simple provision of more research funds to universities for the study of environmental/land-use problems will not necessarily produce outputs that practitoners will find usable. There is a fair chance that such a policy will produce less research, since we observed through our interviews that the financial security of researchers and university departments seemed inversely proportional to their interest in practitioner affairs. The researchers that do not have national foundation grants often solicit research contracts from local groups, while the "independently wealthy" researchers disdain such contract research.

In making these recommendations we should also note that we have had the opportunity to sample "in the field" the quality of university-practitioner coordination that results from the "cooperating agency" concept now being promoted. A practitioner told us that he received a long-distance call from the secretary of one university research project asking, "Would you be willing to tell the funding agency that we've been cooperating with you?" "No, unless you cooperate." [Pause while the secretary consults someone else.] "Well, if we sent someone to talk to you would you tell them we're cooperating?" It appears that the new requirements may be answered not with new working relationships but only with decorative declarations.

RECOMMENDATIONS

1. The quality of the relationship between researcher, the place where the "need" is experienced, and the place where the power to respond to the need is delegated by Government, is critical to the effectiveness of any university research effort applied to community needs. We have observed that university researchers are typically not very well connected to practitioner groups in environmental and land-use planning and that institutional barriers may separate practitioner from community "needs." Further, the authority for acting on environmental problems is likely to be dispersed among a multiplicity of governmental agencies.

Academics are often quite innocent of the massive operational problems related to the implementation of innovations in Government. Therefore we believe that research management groups, consisting of representatives of a university, affected governmental agencies, and the "community," should be used to increase communication and maintain project balance in environmental land-use research projects. As university and practitioner groups are presently encapsulated, the establishment and maintenance of dialog might be stressful and "unnatural" to the participants. Because of this we believe it would be advisable for a funding agency to monitor independently the quality of cooperative research relationships to make sure that they were authentic.

2. Relief from most problems associated with environmental and land-use planning involves substantial developmental work over time. We have noted that the "test-tube approach" to research is likely to result in "one-lump reports" particularly unsuited to the kinds of incremental, "muddling through" activities that characterize environmental problem-solving efforts. We feel that a sustained working relationship, implicit in the "research management group" concept, would be beneficial, but that research design should also be of a deliberately *iterative nature*. Concepts from researchers would move to practitioners for "testing," back to the researchers for improvement, then back for more testing, and so on. We feel that a great deal of mutual learning could take place in this manner.

3. Community service skills should act as a criteria for academic advancement of faculty members working on environmental problems, much as artistic skills are considered for advancement in the dramatic or graphic arts. Under the present university reward system, any faculty member who wholeheartedly worked in cooperative research in idiosyncratic local settings (and teaching) probably would be risking his university career. Large funding agencies have a great deal of potential leverage in promoting revisions of university promotion practices by virtue of their research support. The Federal Government has established conditions for aid that have been effective in promoting equal opportunity employment and even modifications of local building codes to allow the introduction of modern construction materials. Similar conditions in establishing research grants to universities would allow funding agencies to promote the recognition of community service together with publication, rather than a prolific record of publication alone, as the proper evaluator for environmental problem researchers.

A second, less desirable, position for a funding agency would be to use "community service" criteria rather than publication track records and academic frame in determining its own research grant eligibility. While this might focus research support on individuals and groups that were more capable of cooperative work on community problems, it has the disadvantage of placing the researchers in a difficult position with regard to the university promotional system.

4. As we have observed that presently more practitioner research is not done in conjunction with universities, we believe that this nonuniversity research could be improved through Federal support. The obvious conclusion is that universities are not particularly advantageous locations for the conduct of practical research on environmental problems. In the field of urban planning it is apparent that the universities have no monopoly on research capability or brainpower and that a number of governmental planning agencies and private consultant groups have equal capabilities. We do not feel that grants should be limited exclusively to university-based research.

An expedient way of producing more focused research in universities is to give practitioner or community groups fiscal control of environmental research grants, specifying only that the funds should be spent with local colleges and universities. This strategy has the advantage of increasing the "ownership" of research efforts that is such a great factor in gaining acceptance for innovative ideas. It has the disadvantage of potentially constraining the spirit of inquiry because of client sensitivity.

In conclusion, we might note that a particularly potent transfer of knowledge takes place through the movement of individuals between "thinkeries" and practitioner offices (graduating students, commercial consultants, extension programs, etc.). We feel that individuals should be able to pass back and forth between practitioner and academic groups more easily. Civil service systems, university faculty evaluation criteria, retirement systems, time schedules, and pay differentials make this sort of direct exchange of personnel difficult, especially at the higher levels of accomplishment. We imagine that national support to promote interchanges of personnel between universities and planning agencies would produce significant knowledge transfer and idea development.

PART IV

CONFERENCE COMMITTEE REPORTS

Chapter 12

APPLICATION OF ENVIRONMENTAL SCIENCES TO LAND-USE DECISIONS

Working Committee on Environmental Sciences

Fred Bosselman
William Cooper
Edward Croke
Stanley Greenfield
Allen Kennedy
William Roach, Jr.
Thomas Roberts
Vincent Schaefer
Sy Schulman

INTRODUCTION

In recent years the public has become increasingly aware that land-use decisions have a direct relationship to environmental problems. Proposals to develop land or to prohibit development are scrutinized to determine their environmental impact. Sometimes this scrutiny is formalized through legislation requiring permits or impact statements, while in other cases the scrutiny reflects the developer's own desire to maintain good public relations. In each case, however, the issue is the same. Namely, what can the environmental sciences tell us about the effects of a particular land-use decision?

The same question is asked by many different individuals and groups. The region planner seeking to locate an airport, the public utility planner searching sites for a powerplant, the homebuilder deciding on the scale of a project, or a citizens' organization deciding whether to support a proposed development, all want information about the effects of various land-use decisions on the environment.

All of these land-use decisionmakers operate in a finite physical world which supplies the necessary energy and resources to make the use and development of land possible. These resources are utilized, manipulated, transformed, and transported as part of the development process, which in turn results in substantial revisions of the nature, extent, and location of the resources so used. Oftentimes, as a direct result of such resource utilization, residuals or byproducts are produced which also must be managed. Historically, it has been the mismanagement or lack of management of these "waste products" which has aggravated many of our present environmental problems.

Land-use decisions, which will affect both the short and long range, need the best possible scientific information on the relationship between land development and planning and the required input (or flow) of environmental resources. The finite nature of resources makes it necessary that they be considered and respected in the context of land-use decisionmaking. The basic goal of the research proposed here is that of assuring adequate understanding of the relationship between environmental resources and land-use decisions.

To reach this goal, the Committee makes two major recommendations:

(1) That research funds be provided for projects that will *increase our knowledge* about the relationship between land-use decisions and environmental resources; section B of this report suggests specific projects in this category.

(2) That equal attention be given to the *dissemination of this scientific knowledge* in a readily usable manner, to the land decisionmakers, more specific suggestions for this type of communication are contained in section C of this report.

SCIENCE AND LAND USE

The Committee considered a wide range of specific research projects for studying the application of the environmental sciences to land-use decisions, including all of the relevant projects proposed in the papers submitted to the conference as well as other projects that were generated by the discussions of the conference and Committee. Inevitably, the list of projects reflects to some degree the particular interests of the participants and cannot be viewed as an exhaustive catalog of all worthwhile research projects. To the extent the listing has any value, it would be because it resulted from the exchange of ideas between land-use decisionmakers and their scientific and academic colleagues.

It would be unrealistic for one to expect that the kind of research suggested in this report will all be funded, undertaken, and successfully concluded within the next decade. The issues involved are sufficiently fundamental and difficult to long occupy and tax the brains and capabilities of the Nation's scientific community. Nevertheless, it is important that a beginning be made.

While the Committee directed its deliberations toward projects that seemed appropriate for funding in the area of research directly applicable to aiding land-use decisions, it recognized that there are numerous other groups actively and effectively engaged in resource management research. Their efforts are not intended to be supplanted or ignored; the task is so large and urgent that no one has a corner on the market of ideas. And certainly no one has a corner on the needed levels of continuing funding that are and will be required. While the Committee has tried to omit projects known to it for which there are major national efforts already underway (e.g., research on national energy policy), some of the research suggested here may already be the subject of substantial research.

*1. *A study of variable risks and environmental perception among population groups*

In striking a balance between acceptable risks of environmental degradation and the costs of reducing or eliminating it, the risk for a selected portion of the population may be unacceptably or unfairly high, even though mean risk is acceptable to the majority. Population groups may vary in the way they perceive or evaluate these effects according to age, sex, race, incidence of specific diseases, malnutrition (or other health factors), income, density of settlement, location within the core-suburban-rural spectrum, and mode of travel commonly used. The study would identify those population characteristics which vary significantly as to their received or perceived effects, as well as the extent, nature, and implications of these differences.

*2. *Identification of areas involving a high degree of natural hazard*

Certain land characteristics, geologic conditions, or other natural conditions present a high degree of natural hazard to urban development. Among such "natural hazard" areas are: flood plains, earthquake hazard areas, unstable soils and foundations, shorelines, steep slopes, limited or unsuitable water resources. Research is needed to define the various degrees of hazard to which particular areas are subject, and to define the relationship of the hazards to the various types of development that may be expected in the area. Such areas should be identified and described so that such natural hazards are given proper consideration in land-use planning.

*3. *The effects of various methods of solid-waste disposal and product design on future recycling opportunities*

An analysis of the design and management of regional solid-waste depositories to enable the development of concentrations of materials so that they may be recycled in the future. Also, analysis of how various types of consumer goods might be designed to maximize both durability and recyclability in order to increase the efficiency of the use of material resources.

4. *Analyze methods of reducing the adverse effects of accelerated storm water runoff from new land and building development*

The development of raw land often changes radically the patterns of storm-water runoff, as evidenced by the increasing frequency and magnitude of flooding, the loss of permanently running streams, the depletion of groundwater resources, soil erosion, siltation, and water pollution. Research should develop improved methods for determining runoff factors (both quantitative and qualitative) for various types of land uses. Some of the runoff control techniques developed by this research could be applied to existing land uses and buildings to achieve the goal of establishing acceptable storm-water runoff patterns.

**5. *Study the predictability of air pollution impact of various land-use patterns*

Research to determine the air-quality consequences of a wide variety of patterns of land development in order that these consequences can be taken into consideration in the land planning process, including the planning of new communities. For example, the planning of communities in a manner that could reduce the need for extensive daily automobile travel would be an important advance toward the reduction of air pollution. Expediting traffic flow, the use of mass transportation and the encouragement of walking and bicycling are part of this objective.

Similarly, careful evaluation is needed in weighing the relative advantages of varying sizes and locations of electric-generating plants. They should not be so large as to overwhelm the local environment with gaseous, fine and large particle effluents, hot water, precipitated residues, and fly ash. At the same time, they should not be so small as to be inefficient for extended use.

Research is also needed to deal with the mismatch between categories employed in land-use planning (land-use classes, floor-area ratios, and densities of various types) and the specific parameter requirements of dispersion modeling techniques (emission and heat rates, stack characteristics, production activity, fuel use, etc.) and on methods (statistical and analytical) to deal with this variability so that long-range air-quality effects of planning and policy decisions can be predicted and evaluated with some degree of confidence.

*6. *Research to improve methods of weighting land and water capability factors in planning*

A common technique in planning is to plot on transparent overlays a series of land and water characteristics which affect the land's ability to accommodate modification or development and to combine these characteristics to form composite land capability factors, which, along with economic and social factors, are translated into recommended categories and intensities of land use. There is, however, a lack of scientific methodology for selecting and weighting these characteristics as they apply to various prospective land-use categories. Consequently, they are sometimes arbitrarily weighted equally, or they may be selected and weighted subjectively. Because of arbitrary weighting, the validity of resulting plans are subject to attack in the courts. Available scientific information and analysis should be incorporated into a methodology with accompanying quantitative and qualitative standards so that land-use analysis and controls may be based on a more precise understanding of composite land and water characteristics.

*7. *Relationship between intensive development and use, and environmental quality of inland lakes*

Recreation in our society is heavily water oriented. The available shoreline of freshwater lakes represents a fixed stock of resources now under rapidly increasing demand resulting from our affluence and mobility. Our lakes, however, are chemical sinks for the total discharge of waste emanating from the surrounding watersheds. The intensity and type of land use within the watershed of freshwater lakes are primarily responsible for lake quality. To develop a land-use plan that will protect the integrity of the lake as a quality resource, much information is needed on domestic and stormwater discharge, herbicide and pesticide inputs from riparian owners, public and private recreational activities, morphology and biology of each specific lake type, dredging and filling of shoreline areas, and surrounding industrial, agricultural, and forestry activities. There is need for a generalizable mechanism for determining the loading capacity that is feasible for a given level of lake quality. The loading capacity should consider social, chemical, physical, and biological factors.

8. *Management of byproducts of air pollution control*

The installation of scrubbers, cyclone collectors, baghouses, and electrical precipitators at industrial plants and fossil fuel powerplants causes solid-waste and water pollution problems (e.g., sludge disposal areas and fly ash heaps). The constructive utilization of this material must be considered in the development of the best land-use planning strategy. Effort should be directed to establish the value of such residues either for current or future recycling utilization. Research should determine potential uses of these byproducts. It may be desirable to plan a linkage of land uses that could profitably utilize such residues, whether in solid or liquid form. Research is needed to identify such viable land-use interrelationships.

*9. *The impact of land development on local and regional hydrology*

The phenomena that govern the movement of water and water pollutants between surface-receiving waters and water-bearing substrata are not well enough understood to permit formulation of reliable, operational, predictive, or evaluative methodologies needed to consider the full hydrologic impacts of land use.

Research should be undertaken to–

- Determine the capacity of typical groundwater resources to satisfy the long-term demands associated with selected patterns of land development;
- Determine the capacity of specific groundwater resources to assimilate the pollutants introduced as a result of land development and regional wastewater disposal practices;
- Assess the susceptibility of groundwater resources to salt-water intrusions as a function of drawdowns or aquifer compaction due to intensive land development.

**10. *Ecological aspects of the preservation of inland and coastal wetlands*

The shallow, marshy areas of our marine coastal zones are highly productive and perform many critical functions. They provide spawning areas for many important marine organisms, and their plant material outflows feed many of our coastal shrimp, shellfish, and marine fishes. Because the water in these areas does not mix rapidly with the offshore waters, waste products dumped into these areas do not readily disperse.

These shoreline marshes have great ecological value that is not easily translated into dollar-based cost accounting, but the long-term ecological and economic risks of their destruction are not trivial. Increasing recognition of these values has led to legislation restricting the filling, diking, and development of these areas. But unless the scientific basis for this legislation is clearly demonstrated it may well be of dubious validity. A research program should be undertaken to–

- Determine the degree of wetland area required to provide a nursery and spawning function for critical shrimp, shellfish, and fish populations;
- Establish the relationship between salt-marsh production and nutrient processing and the quality and stability of the inshore marine ecosystem;
- Determine the material and thermal assimilation capability of the wetland habitat within various quality constraints. In particular, determine the long-range effects of material and thermal pollution on the remaining lake or marine ecosystem; and
- Determine the location and scale of wetland habitats required for the maintenance of the many bird and mammal species that require these unique areas.

**11. *Determination of biological and physical factors that make certain ecological areas inherently "fragile"*

Landscapes contain groupings or organisms (animals, plants, microbes) that are integrated arrays designated as biological communities. Many of these communities represent biologic resources that can provide man with recreational, esthetic, food production, and waste assimilation opportunities. Land with well-developed organic soils, vegetation with high growth rates, and animals with broad physiological and behavioral tolerances are ecologically tough and can absorb considerable human use. Other landscapes such as the arctic and alpine tundra, sand dunes and deserts, are extremely fragile, and human use or development will invariably lead to environmental degradation. The intensity and distribution of human utilization should be responsive to ecological limitations.

The relationship between the scale and intensity of human development or utilization and the stability and succession of a range of ecological systems needs to be determined. Research is also needed to assess the feasibility of manipulating biological and/or physical aspects of prototype "fragile" systems to increase their degree of ecological "toughness."

**12. *Environmental impact of specific large scale transfers of water*

The movement of large amounts of water between watersheds creates poorly understood physical and biological effects in recipient watersheds. The impact on atmospheric and soil systems of significant increases in water application to large regional areas should be determined, with emphasis on the nutrient cycling and breakdown in organic material in the soil. The research program should also determine the ecological and limnological effects of reduced water and nutrient flows within the donor watershed and on the normal downstream recipient—a lake or estuarine community.

The existing law governing diversion dates back to periods in which the attitudes toward land development and the natural environment were significantly different than they are today. The United States Supreme Court has recently indicated its encouragement of the development through common law methods of a Federal law to govern major interbasin transfers, and a number of states are considering the revision of their water legislation. Scientific research in this area should be oriented in a manner that will facilitate the formulation of new legal rules that reflect environmental considerations in water allocation.

**13. *Creation of standards for the location of land uses to minimize human stress caused by noise*

A growing body of scientific research is showing the effects on the human animal of the stress caused by noise. This research shows that the effects of noise are substantial and are often based on facts that are more subtle than traditional measuring techniques have revealed.

While a substantial body of additional basic research is needed in order to learn more about the various elements of this noise-based stress, sufficient information is now available that a beginning should be made toward translating our knowledge into standards for governing the location of land uses. The existing attempts to establish performance standards for the location of industry and other land use based on noise show little input from current scientific research on the real effects of noise.

14. *The development of standards relating to mass, shape, and orientation of buildings and streets as related to atmospheric parameters*

The microclimate of cities is related to the individual and aggregate assemblage of structures. If a street is aligned with the prevailing wind, the velocity of the wind will be increased. The profile of tall buildings will affect the buildup of local air avalanches and similar air accelerations. For example, if streets are alined with the prevailing wind and a reduction in wind velocity is desired, horizontal irregularities in the form of trees, fences, and other structures may reduce the problem. In new communities alinement of streets can be planned at a bias to the prevailing wind. If ventilation and removal of residual air is a desired feature, the alinement of streets and buildings can be planned with this in mind. Research is needed which can increase our knowledge of the factors involved in urban microclimate.

15. *The impact of trees and other forms of vegetation on physical and esthetic needs in the environment*

Trees and other forms of vegetation placed in specially designed plantings serve as effective air-pollution filters. In addition to serving as a particulate filter, vegetation serves other roles ranging from cooling the air, giving shade from the sun, screening out noise, and enhancing the esthetic value of a region. Thus, they can provide the land-use planner with a variety of assets and few disadvantages. Research is needed to establish better all of these relationships on a firm physical, biological, and ecological base.

Additional research is also needed to establish the most rugged varieties for these special needs. Studies are needed of growth rates, resistance to disease and pollution, effectiveness of branch and leaf structure, degree of water consumption, and ease of care. A considerable amount of data is already available, but it needs to be evaluated, assembled, and made available to all who need it.

16. *Environmental impacts of urban mass transit innovations*

Analysis is needed of the effects of providing mass transit to reduce areawide pollution levels and other environmental degradation; for example:

- Determine the extent to which the concentration of feeder buses in the vicinity of rail rapid transit stations will increase air pollution and noise levels around these stations;
- Analyze whether rail rapid transit lines will create noise, vibrations, or other amenity problems in adjoining neighborhoods;
- Examine whether exclusive or limited-access bus lanes will produce corridors or unacceptably high air pollution and noise levels;
- Analyze whether electrically driven rail transit systems will impose inordinate levels of power demands at far-removed plant sites, thereby transferring their environmental effects to a distant site, and whether the transmission lines which carry this power to the system will produce negative visual or other effects.

17. *Environmental impact of feedlots and other intense agricultural practices in urbanizing areas*

Increasingly, conflicts are arising between agricultural operations and participants in the recent trend toward urban sprawl. Certain agricultural activities, such as feedlots, have been traditionally located near water sources, and in many areas are now located within a short distance of housing developments and/or waterways. Social and ecological conflicts arise from the treatment and distribution of the solid, gaseous, and liquid waste resulting from these operations. Many existing operations are forced to relocate due to social conflicts, and undergo significant design alterations owing to environmental quality regulations. Research should establish mechanisms for evaluating desirable scales and locations of these agricultural operations in order that they can be properly integrated into land-use planning.

**18. *Maintenance costs of synthetic biological communities*

Biologic communities have evolved mechanisms to regulate their own behavior, such as predation, competition, parasitism, and territoriality. Biological communities synthesized by man (rose gardens, lawns, fish ponds, agricultural plots, etc.) seldom contain a sufficient or suitable mix of organisms to insure the necessary internal regulation. Man must, therefore, provide the required maintenance using chemical controls (fertilizers, insecticides, herbicides). The magnitude of this maintenance responsibility is apparent from the large amounts of fertilizers and pesticides leaving metropolitan areas through domestic and storm-water discharges.

Relatively natural landscapes (ecological greenbelts) can provide many esthetic and recreation opportunities without these enormous maintenance costs. Land-use decisionmakers must develop a better understanding of unit diversity and scale necessary to maintain stable plant and animal populations within and outside of metropolitan areas. Research is needed to determine the scale and unit diversity (genetic, species, spatial) required to generate synthetic biological systems that have minimal requirements for chemical control and maximum long-term existence.

19. *Communication systems as an alternative to transportation*

Traditionally, planners have tried to predict transportation demand as an independent variable, and then proceeded to plan the transportation facilities that would be needed to accommodate these demands. More recently, because of the extremely expensive nature of transportation in terms of time, money, resources, space, and human life, planners have attempted to project other variables in a way that would induce an acceptable level and nature of transportation demands. Some of the functions historically provided by transportation facilities might be better provided by other means such as telephone, television, and online computer hookup and other data linkages. Research is needed to explore emerging communication technology in order to identify those forms of communication which might supplant or supplement transportation systems per se. To the extent possible, the study should also identify specific functions that might be provided, and the costs and environmental impacts which might be anticipated in comparison with traditional means.

**20. *Alternative rates of energy consumption resulting from various settlement patterns*

The limited amount of easily extracted fossil fuels remaining and our increasing demand for energy appears to be stimulating a national shift away from direct use of fossil fuels in energy production. This shift will require a sophisticated technology and will significantly affect the evaluation of land-use patterns. In particular, the costs of transporting man and material will come under question. We probably have underpriced the cost of the energy and facilities required to move materials and people. This has encouraged greater aggregations of people, industrial, and agricultural activities. It is easy to conceive of the shift away from organic fuels to other sources for generating electrical energy to operate stationary facilities (lights, air conditioners, etc.), but the technology to do this for our transportation does not exist. Research is needed to compute an energy maintenance budget for transportation and functions associated with various degrees of spatial aggregation of production and consumption processes.

21. *Waste material budgets for major industrial, agricultural, and commercial operations*

The impact of the location of a given class of production operations on a region can partially be inferred from a material budget of the operation. The difference between the chemicals purchased (inputs) and the chemicals contained in the marketable goods (outputs) constitutes this total volume of waste materials (residuals). These materials constitute an increased load on the locality's waste-processing capabilities and the local demand on environmental assimilation opportunities. Knowledge of this form of impact could lead to future legislative changes which would then make it possible for future land-use decisions to be made on a more rational basis. Research is needed to develop a classification of waste-material budgets for representative classes of production and commercial operations.

DISSEMINATION OF INFORMATION

As the practitioners and researchers discussed for several days areas in which research was needed, it became apparent that both felt a common frustration. The practitioners learned of a variety of scientific research projects that would have been helpful in making land-use decisions had they known that the projects existed. The researchers found that only a small fraction of the potential opportunities for making practical use of their research was being utilized.

The Committee believes that the usefulness of existing and future research could be multiplied many times over by the creation of new systems for disseminating the results of research in the environmental sciences to the land-use decisionmakers. Moreover, the Committee feels that the creation of such systems is ideally suited to certain funding agencies. The Committee recommends consideration of four such systems of communication.

First, an extensive series of short courses, seminars, and exhibitions should be sponsored at which land-use decisionmakers could meet the researchers and learn firsthand the results of their research. Existing meetings and programs should be utilized wherever possible. The Committee believes that this type of program provides a highly effective way of communicating to the land-use decisionmaker.

Second, some organization or organizations should establish a central staff whose function is to monitor research in the environmental sciences and provide advice to the busy decisionmaker in the way he is most accustomed to obtaining it—by picking up the telephone; of course, the scope of the advice to be given would need to be carefully delimited if the project is to be administratively feasible.

Third, new periodical literature needs to be created for distribution to a small but growing coterie of practitioners who are specializing in environmental subjects. The title of "environmental planner" is increasingly found on the staffs of the larger planning agencies and in the offices of major corporations involved in land development. While the periodical literature in the area of pollution control is voluminous, there is no readily available source of published information on the land-use effects of environmental science research.

Fourth, a series of how-to-do-it manuals might be prepared for the land-use decisionmakers. These manuals would describe the ways in which the findings of environmental research could be applied to specific land-use decisions. Some of the specific research projects discussed in this report would lend themselves to such manuals.

Of course, land-use decisionmakers are already deluged with information on a wide variety of subjects. Systems for conveying information on the environmental sciences will need to be designed carefully in order to make themselves heard through this overdose of media. Ideally, the organization or organizations should be able to obtain the confidence of both private decisionmakers and the public decisionmakers at all levels of government. If these services are performed adequately, they might eventually prove so useful to the decisionmakers that they could become self-supporting through user charges.

Chapter 13

SETTLEMENT PROBLEMS AND URBAN DEVELOPMENT STRATEGIES

Working Committee on Settlement Problems

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THE PROBLEM

Patterns of settlement, the manner in which people and activities are distributed across the face of the land, have profound and pervasive national consequences. The despoliation of the countryside and other deleterious effects of current land-use patterns on the deteriorating quality of the physical environment are tangible and easily perceived. Less evident perhaps are a host of complex economic, political, and social problems that are also directly linked with evolving patterns of land use.

We view as problems: the dense concentration of the poor and minority groups in deteriorating neighborhoods, remote from jobs, services, recreation, and other opportunities; lengthening journeys to work with mounting traffic congestion and transit costs; the exponential rise in energy and resource consumption; and the cultural isolation of many new subdivisions and massive housing projects. These and other similar problems are related to and aggravated by prevailing trends in urban development.

Countless isolated individual decisions about where and how to work and live are reflected in the spatial distribution of people and activities in the United States. Combined, these separate decisions largely determine national, regional, and local settlement patterns. Thus, changing land uses often mirror widespread changes in the economy and society. They reflect such things as technological advances, social mobility, racial and class prejudice, changing life-style preferences, and new forms of family, community, and political participation.

There is good reason to believe, nonetheless, that the patterns resulting from the many individual decisions are not those desired or foreseen by the individual consumers, firms, and public officials. Rarely are the indirect, cumulative consequences of their separate choices consciously considered in the decision process.

Keenly aware of the many societal problems linked to settlement patterns, policymakers are beginning to examine closely unresolved land-use and development issues. At every level of government, we find activities underway to create and implement growth and development policies, protect our environment, increase opportunities for minority and low-income groups, revitalize central cities and declining rural areas, and reform our transportation systems. But is all this activity likely to yield desired results? In the face of powerful social and market forces, current policies and programs at all levels of government often work at cross-purposes, and rarely are determinative.

The long-term effects of settlement patterns on natural and human resources and on culture are not understood. Research to date indicates that current patterns waste valuable natural resources and may impede social and cultural development. But we do not know to what degree this is true.

In any case, these are very real, immediate problems associated with current patterns. For example, social inequality with respect to the distribution of wealth, income, and power has become an increasingly explosive issue. This inequality is reflected in settlement patterns and to some extent reinforced by them. Much has been written about the effects of current patterns on the physical access of low-income and minority groups to housing, jobs, recreation, and other opportunities. While the effects are evident, policies that would counteract them are not.

Although the deterioration in environmental quality is also a function of settlement patterns, current approaches to environmental protection do not recognize this. Our understanding of the relationships is too imperfect to provide a sound basis for a new approach.

The purpose of this report is to summarize our current understanding of settlement pattern phenomena and to suggest research priorities which will help us to improve this understanding in the light of our most urgent needs. Coming to grips with issues relating to settlement patterns will not prove easy. It is only recently—roughly since World War I—that we have considered it feasible to intervene locally to guide urban land uses, and it is only since World War II that national policies were devised to deal with these issues in most countries throughout the world. In the United States in particular, governmental institutions at metropolitan and regional levels, that would correspond to the enlarged scale of urban settlement, are often nonexistent. And most State governments have been slow to respond to the problems emerging in vast urban agglomerations.

To improve our capacities to shape our collective futures responsively and create new institutions and policies that can effectively guide future land uses, there is a critical need for sustained research on the problems associated with patterns of settlement. There is need for a serious systematic search for superior alternatives.

DOMINANT TRENDS AND PRIORITY ISSUES

Looking toward the future, it is evident that before the end of the century we shall have to accommodate no less than 60 to 70 million additional people in cities or, more precisely, in urban fields (vividly described by John Friedman in Chapter 3). Urban growth in the United States has become a self-propelling phenomenon. With only 5 percent of the Nation's population (about 10 million persons of the 1970 total of 203.2 million) still engaged in farming, migration takes place principally among and between urban regions or within the growing spatial expanses of metropolitan fields.

Clearly, the main thrust of our research efforts should be directed toward understanding the dynamic structure of these expanding urban fields (their socioeconomic composition, characteristics, problems, and governance, and the ecological implications of urban development). It is here, in growing metropolitan regions, that the urban problems and opportunities are to be found.

Let us briefly review major trends in urban growth as revealed by comparing the U.S. Decennial Census of 1970 and previous decades so as to highlight a few priority issues for research:

1. Centrifugal movements have been a dominant trend in city growth for decades, but the rate of decentralization appears to be accelerating. During the 1960's, for example, suburban population increased 28 percent, that in central cities only 3.2 percent. By 1970, only 64 million persons in the United States lived in central cities, as compared with 76 million in suburbs and 63 million outside metropolitan areas.

2. Despite continuing rapid urbanization, population densities in urbanized areas have been declining. For example, between 1950 and 1970, average densities of settlement fell from 5,408 persons per square mile to 3,376 persons per square mile in all urbanized areas. Within just the central cities, population densities also declined sharply, from 7,786 persons per square mile in 1950 to 4,463 in 1970.

3. The urbanization of blacks continued unabated during the 1960's, at a more rapid rate than whites, and by 1970, 58 percent of the 22.5 million black persons in the Nation lived in central cities compared with only 28 percent of all white persons. Blacks have also been moving out to the suburbs, but more slowly than whites and mostly into a relatively few communities. By 1970, blacks comprised only 4.7 percent of total suburban population, scarcely more than the 4.2 percent in 1960

4. Employment opportunities have continued to increase most rapidly in the suburban ring. By 1970, for example, jobs in the suburbs of the Nation's 15 largest metropolitan areas equaled or surpassed those located in central cities. In contrast, jobs located in central cities in 1960 composed about two-thirds of metropolitan employment totals. Consequently, by 1970, only one in four of all workers who lived in the suburbs still commuted to jobs in central cities. The era in which suburbs served primarily as dormitories for city

workers is long since past. The automobile is the dominant transport mode, used by 77 percent of all workers in 1970 to journey to work, with only 8.5 percent using mass transportation and 7.5 percent walking. The comparable proportions in 1960 were 65 percent who journeyed to work by automobile, 12.5 percent by mass transportation, and 10 percent by walking.

On the assumption that these trends will prevail, a few key issues for research and policy analysis can be identified:

1. Finding ways to guide new growth on the urban fringe in a manner that is both orderly and equitable is of pivotal importance. It is cheaper and far easier to guide new development than to transform already settled areas. For example, residential development on flood plains or over major land faults should obviously be eliminated. Yet, not long after the recent series of devastating floods and quakes, the residents of stricken areas mostly returned to business as usual, of necessity, on the same sites.

2. Declining densities in older core cities would appear, in the long run, to offer opportunities to renew and reuse scarce land in a manner that would improve living conditions in central cities. The immediate and transitional problems, however, are severe. Buildings, entire neighborhoods, and, in effect, whole cities, as in the case of Newark, are being abandoned. The historical process of succession, abandonment, and renewal for higher uses in the market has broken down, partially as a result of competing peripheral growth and racial change. Finding ways to redevelop and revitalize these declining neighborhoods, perhaps at lower densities, remains a crucial area of concern. Since the residents of these neighborhoods are frequently poor and often black, without physical access to the resources of the region, policies focused on their immediate needs are vital.

3. The growing frequency of cross-suburban commuting that has resulted from decentralized patterns of urban development and the spatial dispersal of jobs highlights a set of critical questions relating to transportation systems; above all, our current heavy reliance on the automobile, a major source of pollution and of resource consumption. Exploring alternative forms of transportation, as well as the possibilities of sharply reducing the demand for transportation through coordinated land-use and facility planning or through communications substitutes, is a line of inquiry fundamental in development.

4. Much evidence suggests that community areas within urban fields are becoming more homogenous internally and less diverse in income, education, age, race, political participation, life-style preferences, and attitudes. To what degree, at what rate, and according to what specific characteristics this has been occurring is a question that gains in significance as urban regions grow in territory, since sheer distance often serves as a barrier to social mobility and cultural interchange. The gradual decline of the compact city and of intense, unprogramed, sometimes abrasive, face-to-face encounters that have characterized city life and creative innovations in the arts and sciences since antiquity raises profound, unanswered questions for the future. For the present, prior questions that can and should be investigated focus, first, on defining the characteristics and monitoring the dynamics of social areas within metro-

politan regions. Second, and going beyond description, we need to analyze the crucial elements in locational choice and in daily activity systems. Third, research should focus on the implications for human and cultural development of current self-segregating trends among neighborhoods. The specific consequences of growing up in internally homogeneous community areas of differing scales, especially as they affect particular social groups and classes, require systematic investigation.

5. The governance of expanding metropolitan regions is another pivotal question. The historical boundaries of cities do not often correspond to the actual territory of contiguous urban settlement or to the networks of functional interrelationships that have developed within regions. Proposals for two-tiered forms of metropolitan governments have been greeted, thus far, with indifference or hostility in all but a few places. It would seem the appropriate instrument for reconciling conflicts among urban-suburban rural constituencies, for regulating resource development and consumption, and for creating new institutions and coordinate policies to guide growth. Some State governments are beginning to recognize their powers and potential role. In 1972, for example, 25 States passed new legislation dealing with a wide range of environmental problems, but the overall performance remains spotty.

6. The effects of urban development on environmental quality are a central concern, and the ecological implications of current trends and potential strategies are little understood. Ecologists studying nonhuman biological systems analyze these systems in terms of a few salient characteristics such as scale, density, diversity, accessibility, vulnerability, and dynamics. However, if one views urban settlements as dynamic, open systems, subject to a variety of exogenous and endogenous forces and constraints (including political, economic, and social factors as well as environmental variables), the kinds of research questions that would be most appropriate to human settlements may differ substantially from those appropriate to biological communities. Nevertheless, the potential usefulness of ecological concepts for studying human settlements should be explored. (For more on this topic, see the addendum to this Committee report prepared by Forest Stearns.) Before turning to specific research questions, let us briefly review the current status of research and the elements common to a broadly conceived future research effort on settlement patterns.

THE STATUS OF RESEARCH

The volume of information about urban and rural settlement patterns has grown enormously, but our understanding of the factors that give rise to them is still lagging. We know how to describe current land uses for specialized functions, such as transportation, education, or health care, and for specific economic sectors such as manufacturing or commerce. We can identify key institutions and public policies that influence current land uses and residential settlement patterns. But our understanding of the ways in which these factors interact and the degree of their impact is exceedingly limited.

For example, a great deal of effort has gone into developing complex, seemingly sophisticated land-use transportation models. Yet these models are still relatively rudimentary and largely descriptive, frequently unsuited to forecasting future patterns or testing policy options that diverge sharply from the past.

To cite another example, there is fairly comprehensive information at 10-year census intervals about where different types of people live, and major factors involved in residential segregation can confidently be identified. But without systematic research exploring the dynamics of residential choice, our understanding of the conditions that would foster voluntarily integrated neighborhoods is constrained. Nor can we measure the real social costs of the vast, isolated poverty areas in the older central cities.

Current land, water, and other resource uses are also fairly well documented, but our vision of radically new techniques for making better use of resources and releasing untapped energy is limited.

In short, we have voluminous data at our disposal, but they are frequently in a form inappropriate to advancing understanding. Although evaluation of public policies is by no means systematic, we are fairly skilled at documenting our failures, but our capacity to conceive, test, and evaluate alternative growth strategies is seriously deficient.

RESEARCH COMPONENTS

There are a number of steps we can take to advance the state of the art. We deem six to be important:

1. *Refining concepts and terminology that describe settlement patterns more precisely.*—Progress in understanding causal relationships in land uses and in building working models of the system would be greatly enhanced if we could describe and measure significant elements and their changes with greater accuracy. For example, such concepts as scale, efficiency, density, equity, accessibility, and environmental amenity should be sharpened and whenever possible expressed in quantitative terms.

2. *Identifying the forces that determine settlement patterns.* Research aimed at locating the levers producing change in land uses is essential to developing effective future guidance systems and policies. We need to understand how specific economic, political, cultural, environmental, and behavioral variables affect the organization and development of settlement patterns at local, regional, and national levels. Work in this area might be comparative, cross-cultural, and historical in character. Another factor to study is the impact of technology (past, present, and future) on the form and dynamics of human settlements.

3. *Assessing the social, economic, and environmental gains and losses (short run and long term) associated with various settlement and growth strategies.* —Techniques for pretesting policy options, for measuring and modeling the impact of various investments in alternative settlement and growth strategies, should be developed. The redistributive characteristics of various approaches to

organizing growth and development are an important aspect of the analysis; e.g., what impact would they have on different segments of the population? The second- and third-order consequences of strategies that have been designed to serve particular groups or purposes, but have had unanticipated consequences, are also important.

4. *Devising incentives and controls that can effectively guide settlement patterns.*—The effectiveness of existing institutional arrangements at various levels of government to guide settlement patterns is questionable. Research in this area might deal with the problems of (*a*) developing new ways of diverting growth from our largest metropolitan areas; (*b*) encouraging social and economic development in lagging regions; (*c*) channeling the migration of households and firms from one area to another.

5. *Identifying ways of representing the interests of diverse groups in alternative strategies.*—The relative importance of specific social, economic, and environmental considerations varies greatly among different groups. We must find better ways to represent a broad range of constituencies in the articulation and implementation of settlement strategies at local, regional, and national levels.

6. *Monitoring and evaluation.*—The successes and failures of the past offer valuable guides to improving future policies and programs. The development of better evaluative instruments and techniques is essential in policy questions, and the institutionalization of research and monitoring capabilities at every level of development activity is a requisite to learning as we go.

RESEARCH QUESTIONS

The research components listed above are designed to circumscribe the parameters of broad investigations that might be undertaken in the coming years. We are in need of constructive alternatives to prevailing patterns and of new long-range strategies for organizing growth and development.

We recognize, however, that decisions, many of them irreversible, must be made in the short run. Therefore research on problems of immediate concern to policymakers and the public is critically needed. To deal with such problems, however, we must continually push toward a deeper understanding of the interrelated forces, institutions, and policies that produce change.

SETTLEMENT TRENDS

**1. *Research on settlement trends in the United States*

Recording and analyzing the evolving distributions of population and economic activity within and between cities and urban clusters of different economic, social, geographical, and cultural characteristics, and determining the main historical and socioeconomic determinants of these trends. Also, analysis of the degree to which residential segregation by race, income, life style, and age is increasing in metropolitan areas and identification of the factors which promote or reduce socioeconomic differentiation among community areas.

**2. *Study of the impact of changing recreational and leisure-oriented living patterns on settlement and activity patterns, including the impact of second homes and recreational vehicles*

What are the future effects likely to be? How have various national policies affected the extent and spatial distribution of recreational activity and second-home ownership? For example, what is the likely impact of various national growth policies upon the demand for recreational land (public and private), and what effects do current Internal Revenue Code provisions have on the demand for second homes?

3. *Study of the degree to which and manner in which prevailing patterns of economic and residential growth in suburbia and the urban fringe exacerbate problems in the inner city*

Analysis of the immediate and longer term effects of the residential concentration of minorities on family and community development, as well as the political implications of such concentration.

DEVISING ALTERNATIVE SETTLEMENT PATTERNS

**4. *Analysis of the effects of alternative settlement patterns (including rates of growth) on the supply and demand for environmental resources*

Can we specify optimal or ideal settlement patterns in environmental terms?

**5. *Analysis of the effects of changes in the supply, demand, and pricing of environmental resources on settlement patterns (national, regional, and local)*

For example, with regard to energy resources, what effects might the discovery of new sources of energy have on the pattern of human settlements? What would be the effect on settlement patterns of a national policy of pricing energy resources at their "full cost"?

*6. *The translation of existing knowledge on environmental constraints into operational guidelines that the practitioner can use in preparing short-term and long-range growth strategies for specific land-use situations*

What would be the social and economic impact of implementing such guidelines?

*7. *Analysis of the effects of alternative settlement patterns (and related institutional arrangements) on nonenvironmental considerations such as social equity, self-educative and self-corrective capacities, and technical and social innovation*

Can we conceptualize settlement patterns designed to optimize such specific objectives?

8. *Analysis of the kinds of policies and institutional modifications which would foster population movements and settlement patterns responsive to the needs and values of a wide range of constituencies (such as those seeking greater anonymity and a variety of divergent life styles); and responsive to the demand for more community participation and decentralization of decisionmaking*

What constraints on individual freedoms (and what new opportunities) are implied by particular settlement strategies and to what extent are people likely to accept them?

9. *Analysis of the possibilities of substituting communication for transportation and the resultant effects on land use*

Study the impacts that various types of substitutions would have on the organization of settlement patterns. Study of the substitution of communication for transportation from the technological standpoint is recommended in the section on environmental sciences.

10. *Study the patterns of urban-type clustering which can be developed in rural areas to increase the efficiency and quality of services for rural families*

11. *The improvement of current measuring techniques for monitoring change in quality of urban and rural life related to land-use changes*

*12. *Developing improved operational models and other estimating techniques for predicting the environmental, social, and economic gains and losses associated with alternative settlement patterns and growth strategies*

13. *Study of means for making choices among alternative settlement patterns, including methods of assigning weights to environmental, social, and economic considerations, and to the attitudes of different groups of people*

IMPLEMENTING POLICIES

**14. *Study the policy implications of the relationships among existing central cities, regional hinterlands, new communities, and growth centers in lagging regions*

(*a*) Methods of linking the decentralization of big cities with the promotion of "growth centers" (the conscious clustering of jobs and urban facilities) in lagging regions.

(*b*) Ways of linking the promotion of new communities or new clusters of urban centers to the improvement of existing big cities.

(*c*) Ways of influencing the range and intensity of the spread effects of urban-center growth on regional hinterlands.

(*d*) New kinds of incentives, controls, and penalties (geared to social costs) that might be devised to compensate metropolitan regions willing to cooperate with preselected growth centers in lagging regions.

15. *Study the policy implications of the development of central cities and of outlying settlements on the lives of minority groups and the poor*

(*a*) In older central-city neighborhoods that have become the exclusive precincts of minority groups and the poor, what strategies and policies would promote development (perhaps at lower densities), facilitate access to mainstream institutions, and reduce inequities?

(*b*) In newly developing settlements and urban clusters outside central cities, what policies would foster social and racial diversity, as for example, requirements of moderate- and low-income housing tied to Federal assistance for sewer, water, transportation, open space, and recreation facilities?

ADDENDUM TO COMMITTEE REPORT ON SETTLEMENT PROBLEMS

Forest Stearns

Our limited knowledge of the cause-effect relationships that determine settlement patterns and link them to quality of life considerations suggests that we should develop new concepts and approaches to the subject. There is a growing interest in the ecological view, which deserves special attention here.

Ecologists have been studying the "settlement patterns" of biological communities for a long time. In the process, they have developed a list of concepts (such as density, diversity, scale, accessibility, vulnerability, and dynamics) that have proved to be useful analytical tools. Many believe that these concepts are applicable to man-dominated settlement patterns of recent origin as well as to the natural systems which have developed under evolutionary stress over long periods. The nature of these concepts is similar for all components of settlement patterns and may be illustrated by discreet, researchable questions.

DENSITY

Density issues are concerned with relative numbers of individuals, structures, and organizational groupings. Density goals are basic to the design and functioning of settlement patterns at all levels. Density implies unit-space relationships which in turn stimulate a variety of specific questions:

Are we too crowded? What is the carrying capacity (at a given level of nutrition, amenity, or health) of a community, region, or continent?

What measures of density are most appropriate for the design and evaluation of human settlements? How is human density influenced by the function of a particular settlement component or by the environmental or social character of a settlement unit? Conversely, how does density influence these factors?

How is the response to density influenced by communication techniques? How does past experience condition individual response to density?

DIVERSITY

Diversity refers to the variety of characteristics among components of settlement patterns, whether economic, functional, environmental, cultural or ethnic/racial. A diverse system implies a variety of populations, land uses, habitats, economic strata, cultures, industries, etc., which in turn suggests alternative pathways for flows and controls.

An increase in diversity theoretically increases the options available to attain a given objective. It also widens the choice of control techniques and the nature of constraints. Consideration of diversity implies a concomitant consideration of "grain" or size, and perhaps shape, of a unit.

Should cities retain functional specialization? How is diversity influenced by change in settlement patterns? At what level of aggregation is diversity essential to system stability in a particular phase or function?

How does environmental diversity influence human response to density or to environmental or social stress?

What is the relationship of diversity to affinity behavior, and at what unit size does this behavior operate?

Can diversity in settlement patterns contribute to stability? Conversely, does lack of diversity increase instability?

What proportion of a "natural" landscape is necessary to support or counterbalance a given amount of man-dominated surface?

SCALE

Scale relates to size or mass of the pattern aggregates and, in conjunction with diversity, establishes the settlement pattern. Issues of scale range from the problems of unit identification and mapping to the effects of aggregate size on the efficiency of functional units. Again, the issue of scale is illuminated by specific questions:

What is the optimum size of settlement units? Does this vary with function? Are the scales of institutional and substantive issues subject to alinement? How can scale discrepancies be resolved when they relate to different phases of the settlement pattern; for example, the economic and cultural phases?

ACCESSIBILITY

Issues of accessibility can best be considered over a background of density, diversity, and scale. Accessibility is measured in time, distance, or energy expended, and is subject to direct technological modulation. The value of a given level of accessibility varies with the nature of the settlement phase and the grain of unit diversity. Issues of accessibility are more relative than those of density and diversity, and are heavily influenced by the social and cultural phases of the system.

Basic questions concern the ability of the individual and the group to reach the resources, amenities, and markets which are needed locally for interpersonal contact, subregionally for functional contact, and, in the broader context, for other needs.

VULNERABILITY

Vulnerability involves stability and survival. As such, it may be an issue for the entire settlement pattern of man as well as for specific components. Vulnerability may vary in time with the degree of pattern diversity, the particular environmental and social phenomena making their impact on settlement patterns, and with the physical nature and intensity of the impaction. It can also be measured by the degree of change or rate of repair after an event of specified magnitude.

Among the questions raised are:

Will the particular component, or entire settlement unit, be permanently changed by a given perturbation? Or will it revert to its former state?

What is the permanent impact? What is the rate of recovery? Will the event reduce future damage?

DYNAMIC FEATURES

A final substantive issue involves the dynamic nature of settlement patterns. What are the rates and directions of change, with the passing of time, in density, diversity, scale, vulnerability, and accessibility? How will the interactions of these issues affect the future course of the system?

Chapter 14

ENVIRONMENTAL ASSESSMENT

Working Committee on Environmental Assessment

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INTRODUCTION

Should the pollution of a scenic natural harbor be permitted in order to provide more jobs for the adjacent community which has a serious problem of unemployment? Should a freeway or major highway be built through a beautiful canyon area in order to improve the access of recreation beaches to 2 million people who strongly desire greater water-oriented recreation opportunities? Should a wild river be dammed, resulting in widespread ecological damage, in order to provide for the growing demands for water in a rapidly growing urban area? Should urban mass transit programs be supported, at huge expense, in order to help alleviate the serious problems of smog and traffic congestion? Should we continue to develop regional public recreation facilities without explicitly dealing with the problems of their inaccessibility to poor and otherwise immobile people? Are the present standards for air pollution, set by the Environmental Protection Agency, appropriate? Should the emissions of sulfur dioxide be abated by a sulfur tax or by outright control? Should a community bring a halt to its growth in population and employment in order to protect its environment? Is the quality of the environment getting better or worse? Are our city planning departments doing a good job of environmental planning? What types of powerplants should we be building to meet the growing demands for power and where should they be located?

The number of questions of this type for which answers are being sought and upon which decisions must be made each year in the United States is enormous. Thousands of governmental bodies at the city, county, regional, State, and national level all are involved.

All these questions have one central similarity: they pose problems of evaluation in which comparisons are being made between alternatives which require the assignment of weights to the impacts of these alternatives—to the gains and losses of environmental, social, and economic things of value; and to the gains and losses of different individuals or groups—in order to reach a decision on the "best" action to be taken. Sometimes evaluations are conducted in a formal, explicit manner and other times they proceed on a more informal and implicit basis. But in either case, a large number of decisions are being made every day involving important, and sometimes critical, impacts on environmental, social, and economic factors of great concern.

In light of the enormous number of evaluations involving environmental considerations being conducted in this country every year and the crude character of operational evaluation methods, the Committee feels that the improvement of techniques for environmental evaluation is a high-priority research item.

THE NATURE OF EVALUATION SYSTEMS

Description of System

At best, evaluation of planning is an imprecise and difficult task. Part of the problem stems from our incomplete understanding of the relationships between changes in land organization and use, changes in the natural environment, and changes in social conditions and individual well-being. The primary controls over the system, the effectiveness of which we would like to monitor, are often not direct and easily observed. Land use may be an indirect product of taxation or national defense decisions, as well as a direct result of conscious regional development planning or land-use regulation.

In identifying where key evaluative systems need to be introduced into the planning process, a simplified taxonomic structure of the planning system needs to be developed. A subjective division can be made between the institution or coordinating agency in environmental planning and the controls or planning outputs that result from activities of the control agency. The mandate, jurisdiction, operational philosophy, openness, and efficiency of the institution is considered amenable to evaluation as well as the effectiveness of the institution's planning efforts and controls. In figure 14.1, a somewhat arbitrary taxonomic structure is suggested where the planning institution is presumed to develop or refine and implement plans and controls. The arrows denote either information flows, physical-biological transformations, or social-environmental interdependencies. A typical planning process can be conceptualized as follows: given the institutional planning system, a problem is identified; the agency responds internally to develop a solution via a plan or control which is represented by the arrow adjacent to $\Delta 1$,[1] and perhaps with

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[1] Examples of various instruments in use or deserving study in this connection are: Density controls, land-use type controls, land coverage, plant investment fees, land dedication requirements, infrastructure location, subsidies and/or charges, annexation decisions, timing, building standards (water, smoke, noise), boundary fixing and population ceilings.

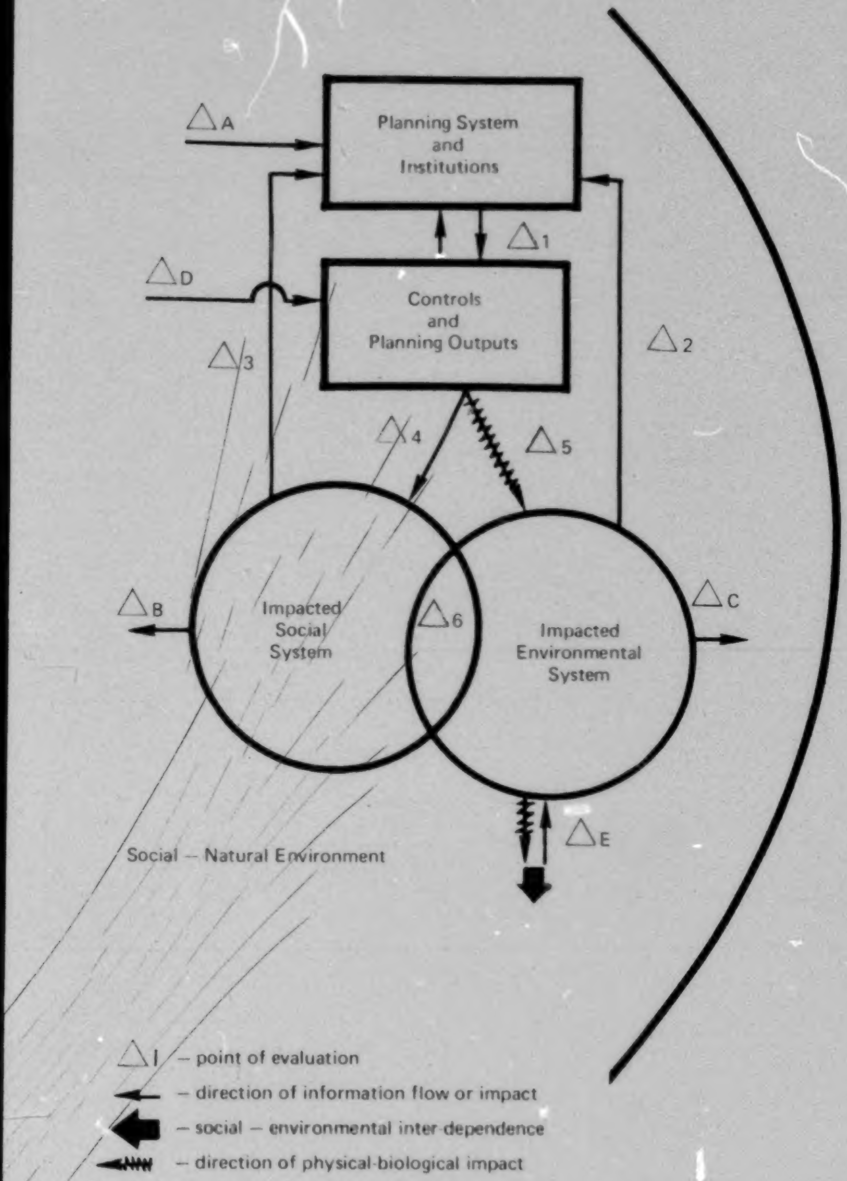
△A
Planning System and Institutions
△1
△D
Controls and Planning Outputs
△3
△2
△4
△5
△B
Impacted Social System
△6
Impacted Environmental System
△C
△E
Social – Natural Environment
△I – point of evaluation
– direction of information flow or impact
– social – environmental inter-dependence
– direction of physical-biological impact

Figure 14.1. Taxonomic Structure of the Planning System

external information or consultation which is represented by ΔA; a plan or control is then implemented with social impact represented by Δ4, and environmental impacts by Δ5. Feedback information flows to the planning institution or agency come from both the impacted social system Δ3, and impacted environmental system Δ2; this feedback information may or may not alter the planning institution's original set of controls, plans, or policies. Information flows also are presumed to occur from the impacted social and natural environmental systems to the social-natural environment that is not directly affected. These information flows are depicted by arrows at ΔB, ΔC, and ΔE. Information flow and institutional controls in the planning agency are presumed to originate in both the impacted and nonimpacted social-natural environment and are depicted by the arrow at ΔA. Interdependence between the directly affected or impacted social and natural environmental systems is at Δ6.

Given the taxonomic structure in figure 14.1, various evaluation mechanisms may be identified. First, from the standpoint of the "general public," its points of information signals, control, or influence are effectively at ΔA, ΔB, ΔC, ΔD, and ΔE. For the planning agency, points of internal control, and therefore evaluation, are at Δ1, Δ4, Δ5, and perhaps at Δ6, while points of information flow are at Δ1, Δ2, and Δ3.

A complete external evaluative mechanism must in essence have criteria for interpreting information flows at Δ6, ΔB, ΔC, ΔD, and ΔE.

Table 14.1 contains a listing of evaluation points and some important criteria that might be used as inputs into both an external and internal evaluative system. These specific criteria are meant to be suggestive as to what considerations should go into evaluating information flows and physical-biological effects. The list is not comprehensive or complete as it is now given in table 14.1. Some criteria are applicable at more than one point of evaluation, and criteria will vary depending on whether the information flow is inward directed, outward directed, or internal to the planning institution. From the standpoint of research on evaluation systems, a relatively large amount of knowledge is available on internal information flows compared with internal-external flows.

Mechanisms in Evaluation

There are at least as many mechanisms of evaluation as there are evaluators, but certain tools of evaluation tend to be widely accepted, criticized, and used. The main such tool is benefit-cost analysis.

1. The concept of benefit-cost (B/C) analysis is inherently tautological since negative benefits are costs and anything can be evaluated with it by sufficiently broadening definitions of benefits and costs. It is, and has been, a

Table 14.1. Criteria for Evaluation of Planning Institutions, Plans, and Controls

POINT OF EVALUATION	DESCRIPTION OF PROBLEM OR FLOW	CRITERIA FOR EVALUATION
△ A	EXTERNAL MONITORING AND EVALUATIONS; INFORMATION FLOW; MANDATE AND RESPONSIBILITY; EVALUATION OF DECISION – MAKING PROCESS.	CRITERIA FOR EVALUATING STRUCTURE; COST EFFICIENCY, RELIABILITY, PUBLIC RESPONSIVENESS–OPENNESS; SPEED OF RESPONSE TO NEW PROBLEMS, INFORMATION COST, FLEXIBILITY.
△ B	INFORMATION FLOWS FROM IMPACTED SOCIAL TO TOTAL SOCIAL SYSTEM.	POLITICAL RESPONSIVENESS; INFORMATION COSTS; GROUP INFORMATION COSTS.
△ C	INFORMATION FLOWS FROM IMPACTED NATURAL SYSTEM TO TOTAL SOCIAL SYSTEM.	INFORMATION; AVAILABILITY AND COSTS; INTERSYSTEM MEASURES OF INFLUENCE; MONITORING COSTS.
△ D	INFORMATION FLOWS FROM TOTAL SYSTEM TO FORMULATION PROCESS OF PLANNING AGENCY.	OPENNESS; ACCESSIBILITY; POLITICAL RESPONSIVENESS; PUBLIC RESPONSIBILITY.
△ E	PHYSICAL–BIOLOGICAL INTERDEPENDENCE BETWEEN IMPACTED ENVIRONMENTAL SYSTEM AND LARGER SOCIAL–ENVIRONMENTAL SYSTEM.	COMPLETENESS; MEASURES OF THRESHOLDS; STABILITY.
△ 1.	PLANNING INSTITUTION DECISION MAKING PROCESS; PLAN FORMULATION AND IMPLEMENTATION.	INTERACTION WITH AFFECTED AND NON-AFFECTED SOCIAL SYSTEM; COST EFFICIENCY OF PLANS; CLARITY IN IMPLEMENTATION OF GOALS; GOAL FULFILLMENT.
△ 2.	FEEDBACK INFORMATION ON IMPACTED OF PLANS ON NATURAL SYSTEM.	COMPLETENESS; VALIDITY OF ENVIRONMENTAL INDICATORS; INTERPRETIVE PROCESS.
△ 3.	FEEDBACK INFORMATION ON IMPACT OF PLANS ON SOCIAL SYSTEM.	COMPLETENESS; VALIDITY OF SOCIAL INDICATORS; INTERPRETIVE PROCESS AND RECOGNITION OF SOCIETAL NEEDS.
△ 4.	SIGNALS, PLANS, AND OTHER REGULATING INFORMATION FLOWS TO SOCIAL SYSTEM.	DIRECTNESS; POLICING COSTS; SIMPLICITY; PUBLIC RESPONSE; FLEXIBILITY; CONTROL PERFORMANCE; IMPLEMENTATION COSTS.
△ 5.	PHYSICAL–BIOLOGICAL IMPACTED ON ENVIRONMENTAL FROM PLAN OR CONTROLS.	WITH AND WITHOUT COMPARISON OF IMPACTS ON STABILITY, RESILIENCY, DIVERSITY, BIOMASS, CARRYING CAPACITY, ETC.
△ 6.	INTER–DEPENDENCE BETWEEN IMPACTED SOCIAL AND ENVIRONMENTAL SYSTEMS.	MEASURE OF BENEFICIAL OR ADVERSE INDIRECT EFFECTS; MONITORING COUPLINGS.

very useful conceptual tool for evaluation, but less useful as an empirical measuring rod. As a conceptual tool, benefit-cost analysis is a form of accounting system where the merits of some action are identified on one side of the ledger and unfavorable factors on the other. Thus, it inherently suggests a tradeoff evaluation and a problem of choice and weighting. Problems have arisen in the past with acceptance of benefit-cost analysis as a tool in: (1) the measurement of benefits and costs; and (2) inclusiveness of the types of benefits and costs. To be empirically useful, benefit-cost analysis requires one numeraire or common measure for all types of benefits and costs. Economists have traditionally adopted the numeraire of money because of its relatively widespread applicability, but other numeraires of even more general social significance can be conceptualized. One such numeraire is time, time devoted to activities by individuals.

Research is needed into discovering an array of numeraires that could be appropriate for different types of land-use planning. For example, land-use plans that significantly involve market outputs might best be evaluated using money as a numeraire. Other land-use plans such as nature trails might be more amenable to evaluation by time or some esthetic appreciation index as the numeraire in benefit-cost analysis. To summarize, research is needed on a variety of types of numeraires, their interdependence, and where each (or several) might best be applied.

2. Other techniques in evaluation include the spectrum of inductive and deductive processes to arrive at collectively acceptable plans or regulatory strategies. Some techniques that have been applied are multidimensional scaling to derive weighted trade-offs; nominal, ordinal, and cardinal ranking rules; optimization and suboptimization design methods; game strategies; statistical decision techniques; and forecasting tools such as input-output models, and alternative future scenarios. These techniques fall into two distinct categories: (*a*) those that attempt to avoid the numeraire problem of B/C analysis by inductive or other means, and (*b*) those that augment the traditional B/C analysis approach. It is too early to gage whether the evaluation strategies that potentially could replace B/C analysis, without confronting the numeraire problem, will prove to be conceptually useful and empirically practical.

3. The role of modeling.—Evaluation seldom is restricted to a single judgment based solely upon the observation of immediate, direct, and obvious effects. More often, judgments must reflect expectations of performance based on a complete set of assumptions about the way the real world operates. Such models, whether implicit or explict, are especially important in evaluation when—

- Plans take effect through a complex chain of social, natural, and technological interactors (as in assessing the effect of air-quality standards on land-use patterns);
- Long timelags occur between observable events (e.g., assessment of flood damage control strategies);

- Decisions are irrevocable or so socially sensitive so as to preclude trial-and-error experimentation (e.g., urban redevelopment, or logging in de facto wilderness).

In considering the use of large-scale system models in land-use planning, there are at least three problems.

First, if the model is so complex as to not allow the user to understand why a certain outcome occurs, this weakens the confidence of the planner (and the public) in its results. Second, if the model is too complex, it cannot be solved with present or immediately expected computer and mathematical operations. Third, the number of technical, professional, and scientific judgments required to describe the system's interactions become so enormous that accurate judgments are discarded in favor of simplistic (and inaccurate) assumptions.

The result is that models tend to be either dimensionally small, complex, and precise; or dimensionally large, simplistic, and very imprecise. As yet there has been no serious examination as to whether models should be developed from large to small, or vice versa; or in parallel. Also, while system models have been built, very little consideration has been given to how modeling and models should fit into the more general evaluative process. We are at a stage in this regard not unlike the perception of one of Rube Goldberg's machines. It is there, but what does it do?

4. *Citizen participation.* – The demands and requirements for citizen participation in planning, today, will require substantial changes in evaluation systems. Of special concern is the communication of information to "relevant" publics for their evaluation. In the past there has been a tendency to treat this as a public relations matter or, even worse, as propaganda. Such treatment is obviously contrary to the purpose of an evaluation system. Information must be made available in a form that makes it possible for the concerned public to arrive at informed judgments. The problem is partly one of context, language, and analytical sophistication: what is appropriate for one group may be inappropriate for another. For some groups, visual and oral presentations may be more meaningful than written and/or mathematical formats. Innovative approaches, including computer graphics, variations of the Delphi method, scenario writing, theaters of the future, gaming, and others need to be explored.

Another dimension of the information problem is that of timing. Information must be communicated to the public in sufficient time to enable interested citizens to interpret and react to it. The timing of feedback information and response by action agencies are critical elements of an evaluation system. Considerations of quick timing are less important during the planning than during the implementation phase. In the latter case, for instance, the requirements are for almost instantaneous feedback and response. For this, on-line computerized systems are suggestive innovations. Joint sessions of planners, decisionmakers, and "relevant" publics with access to computerized simulation programs may be required in other instances. In any event, some sense of response must be communicated to the participants to maintain the credibility of the system. Pro forma consultations are ultimately self-defeating, even under pressures of time.

5. *Special problems in evaluation.*—Because human beings are an integral part of the evaluation process, certain aspects of their individual and group behavior can significantly influence the effectiveness of an evaluation system. At least three important areas in information processing may compel a caveat. The first warning derives from emotional factors in response. These factors can skew judgments seriously, especially when the evaluation system forces individuals or groups to make tradeoffs among their own conflicting values that the system makes explicit. The second warning comes from another kind of bias. Because of the way in which humans process information or because some variables are inherently easier to measure and present in an easily assimilable way, information may have built-in biases which are difficult to equalize without study of the mechanical and behavioral processes involved. The third warning is embedded in the process of broadening the base of planning to incorporate both technical evaluation and participatory processes. The inequality of information produced and used by these two processes derives largely from past experience, but combined with present attitudes toward the relevance of participation, we can expect learning to take place and a shifting back and forth between the two classes of information. The specific issue to be addressed regards the relevance and weighting given to information in a specific planning situation—an issue that certainly deserves study.

Goals, Objectives, and Indicators

Evaluation for environmental and land-use planning necessarily involves the identification of distinct, operationally useful variables which indicate, directly or indirectly, environmental conditions and serve as planning targets or measures of success or failure. A number of indicators have emerged to stand as interim guides to action.

Some common indicators of the built environment and socioeconomic factors are—

- Land use
- Infrastructure capacity (e.g., roads, sewers, water supply)
- Housing stock (by type and dollar value)
- Tax base (or property values)
- Population size and composition
- Household income

Similarly, since it is difficult to comprehend the condition of the natural environment in its entirety, a select number of indicators are used as surrogates, including—

- Relative stability of the ecosystem
- "Carrying capacity" of the ecosystem
- Species composition (wildlife and vegetation)

- Biomass
- Geologic and hydrologic processes (erosion rates, flood peak frequency, etc.)

Also of interest to land planning are composite expressions depicting the interface between social and natural systems:

- Population density
- Intensity of development, including:
    - Building heights
    - Proportion of land covered by buildings
    - Proportion of land covered by impervious surface
    - Land disturbances

One can certainly question the degree to which our present stock of indicators serves as an adequate frame of reference. It is important to question the consistency, specificity, and validity of such indicators, and to develop more accurate descriptions. Some indicators are used because of ease of measurement rather than accuracy. We must, however, ascertain the degree to which indicators actually represent the more ultimate goals, lest these imperfect indicators become targets in and of themselves, and warp the planning process.

HIGH-PRIORITY RESEARCH

**Methods of Facilitating Citizen Participation in Evaluative Systems for Environmental and Land-Use Planning, and the Consequences of Such Participation*

The study would identify and evaluate alternative methods of including public participation in the environmental evaluation process. It would address the problem of effectively communicating to the public the often detailed and technical information of significance to environmental evaluation. Alternative methods of communication and participatory evaluation should be explored, including man-gaming, computer graphics, Delphi methods, scenario writing, theaters of the future, and others. The effects of such participation on the functioning of planning and decisionmaking agencies should be analyzed.

The scale at which participation in the evaluation process takes place also needs study. This should cover "sense of community," which provides both insights for evaluating environmental quality and a motivating force for public participation in the evaluation system. The study would analyze the dynamic nature of the interrelationships, identify other elements which are importantly involved in the system (possible examples are scale of the community, access to decisionmakers, and property ownership), and indicate how the knowledge can be used to improve evaluation systems.

*Improving Technical Evaluation Methodologies

Participatory evaluation will never be a complete substitute for technical evaluation methods such as benefit-cost analysis. In fact, effective citizen participation depends upon solid, technical information. This research program seeks further improvements in operationally useful technical evaluation methodologies. Included would be the identification and description of the evaluation methodologies that are being employed by various groups in different situations; for example, how do ecologists go about evaluating environmental tradeoffs, how does the legal system evaluate those tradeoffs, how does the economist evaluate them, and how do the evaluative systems of different groups compare? Another component of the study would be the development of new numeraire measures that will facilitate the comparison of alternatives involving otherwise noncomparable impacts.

The Inclusion of Equity Criteria in Environmental Evaluation

The issue of equity is of great importance today, yet evaluation methods frequently exclude equity considerations. There is need to explore means of including equity factors into technical evaluation methodologies, such as benefit-cost analysis. The extent to which equity can be accounted for in evaluation systems by participatory procedures would also be explored. Selected case studies may suggest useful insights for this purpose, such as a study of the role and evolution of the public hearing as part of the transportation planning process.

Monitoring of Ongoing Programs

Numerous programs and agencies dealing with environmental quality through various forms of direct and indirect land-use planning operate with little if any knowledge of their effectiveness. Improved methods of monitoring and evaluating ongoing activities in the environmental/land-use field by designing, installing, and operating monitoring systems for action agencies should be explored. Among the questions to be answered are: What proportion of a program or agency budget should be allocated to monitoring and evaluation? Who should do the evaluation? Where should the evaluation be lodged in the organization structure of the public system and what relationships should exist between the evaluator, the officials of the program or agency being evaluated, higher levels of government, and the public? How can adverse evaluation results be communicated to program officials in such a way that it will be used in the most constructive manner?

Evaluation of the Environmental Impact Statement (EIS) Process

Such study would be concerned with monitoring and evaluating the entire EIS process (under the National Environmental Policy Act), including EIS preparation, review, and inclusion of results in the planning process.

Chapter 15

DATA

Working Committee on Data

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INTRODUCTION

An astounding acceleration in the accumulation of basic or raw data has occurred in recent decades. The organization and management of these massive amounts of information into meaningful and useful systems is a challenging task. Yet progress must be made in accomplishing this task, if the practitioner in environmental planning is to do his job more effectively.

A major factor accounting for the data revolution has been a many-faceted technological explosion that has made it possible to obtain, process, and disseminate a greater variety of information more expeditiously and efficiently. Improvements in instrumentation on many fronts certainly has made a most significant contribution. The invention of many new and more sophisticated observation, measuring, and recording devices has greatly facilitated data collection. The technology of remote sensing, which now includes the capability of making observations of the earth, from orbiting spacecraft and from high-altitude (50,000 to 70,000 feet) aircraft, along with improved capabilities from low-altitude aircraft, has undergone remarkable change during the past two decades. Accompanying such improvements as these which have so greatly enhanced our data-gathering capability has been the monumental impact of electronic data processing made possible by the appearance of sophisticated electronic computers. At the present time we are perhaps at the threshold of more technological innovations that are still urgently needed if present problems in data acquisition, processing, and dissemination are to be resolved.

But with all of this activity, the needs of the planning practitioner and the researcher are not being met. The earth satellite is a product in search of clients. The data are coming because the facility is there and not as the result of identified need.

What is required is a concerted effort to close the gap between the data being generated and the specific needs of the practitioner. A series of studies is needed which will identify where improvements can be made toward more effectively interfacing the user to the data sources. This is not necessarily long-term research, but it will have long-term results.

The need to move expeditiously on the issue suggests the importance of looking backward to such efforts as HUD-funded data banks, URBANDOC, and the USAC studies. We cannot afford to commit the same mistakes twice. Such a study would help to guide data collection efforts and to insure that the money to be spent will produce answers of continuing value to the practitioner.

THE USER'S CONTEXT

Since a stated purpose of the research needs identified in this Committee's report is to increase the utility of data collected to the user, particularly the practitioner, it might be well to look briefly at the varied needs for data and its handling.

Most planners concerned with the physical environment use data in three different tasks: Research, plan preparation, and decision implementation. The nature of data, and the method and rapidity of retrieval vary in each task.

Research may require only limited data for comparison by visual means, as in establishing the soil capacity of a parcel of land, or it may require sophisticated models or statistical techniques, as in setting standards for pollution levels. The allowable retrieval and processing time is greatest for researchers because their work is usually scheduled on a less-pressing time scale and the work usually does not involve bringing together groups of people who are difficult to assemble, with "real time" answers important.

Preparing plans, particularly in larger agencies and larger physical settings, involves different time dimensions than does research. Time delays for data retrieval, while more critical than for research, are still usually acceptable. Even here, however, there is value to real-time answers, so that the key "actors" can engage in a dialog about potentials and consequences of alternatives.

For implementing decisions–say, the construction of a short stretch of highway, a tot lot, a manufacturing plant, a State mental hospital, or a watershed development project–the side effects, such as traffic, noise, and air pollution emissions, are usually more localized and system considerations requiring model capability are less likely. Projects with large side effects–major shopping centers or powerplants–may require evaluation with models because their side effects impact other systems (e.g., transportation, housing) and not just a localized site. In either case, real-time answers about changes and impacts would be very useful, particularly if the developer, public agency officials, and citizens were all involved in meetings on the project. Adapting information systems to this type of task has to date received relatively little attention.

In performing these three tasks, planners and researchers rely on two types of data–descriptive data, i.e., those related to present conditions (e.g., census data) and to indices of change. Both types are necessary for a better understanding of fundamental relationships, as well as for better forecasting of future consequences of current actions.

OBJECTIVES OF DATA IMPROVEMENTS

An information system of sorts now exists. It is highly varied in its components, discontinuous, and thus far, has not met the needs of the practitioner effectively. A new unitary system is not likely to be created, and if it were, it would soon require changes in response to new needs.

Improvements to the existing system can be made, however. The key is to improve the most critical elements first. It is vital to the current and future planning of our physical environments that funding agencies address themselves to these priorities. Such improvements should be directed at achieving a number of key objectives.

Organization of Data Collection

Much of the potential usefulness for existing data is lost because the data are not comparable. A high-priority objective, then, is to make data gathered by one group compatible with and useful to other agencies. This requires a common format or set of rules covering some of the aspects described below: classification, area, identifier, etc. It is unnecessary and appears undesirable to centralize the total data collection function within any given level of government.

Data comparability is needed not only among different agencies at one level of government but also among the various governmental levels; there should certainly be sufficient comparability to enable the transfer of information beyond governmental jurisdictions.

A coordinated system requires an organization or management effort to bring it into being and to maintain it. A first priority must be given to vesting authority at various levels of government within some organization to require comparability among data sets and to establish the necessary guidelines for comparability.

Access

Another high-priority objective is to improve access to data. The most important aspect of access is to improve the identifier or coding system. Given the requirements of environmental planning, geographic coding systems should be strived for when possible.

Another aspect of access needing improvement is real-time access, as compared to the often, long current turnaround times found in many information-retrieval systems. Two key tasks in planning physical environments would greatly benefit from real-time access. The first of these is the ability to speculate about alternative possibilities and breakthough improvements, and to enhance learning by doing so. The second is the ability to answer questions quickly about the possible adverse impacts of specific development proposals.

A third, and growing, issue is to extend access beyond the current group of technical experts to include citizens, elected officials, and Government administrators. The problem is related to the division and mistrust between the professionals and those who must accept or reject their work. It is a concern in some parts of the country with technocracy and in other places with unresponsive Government. Information is power and access to information and the ability to use the same tools as the professional is a growing demand on the part of public officials and citizens.

Data Classification

There are two main weaknesses in using current classification schemes to solve problems relating to the physical environment. The first is uniformity of classes. There is a tendency for data collectors to use their own classification schemes. In addition, many of the existing standard land-use classification schemes are based largely on economic criteria and/or on the nuisance value of side effects. Neither of these attributes is particularly useful in evaluating environmental implications of alternate development possibilities. Therefore, the objective of evolving a uniform or compatible classification scheme should receive priority attention.

Data Acquisition: Method, Frequency, Priorities

The range of methods for data acquisition is increasing from direct interviews in attitude surveys to remote sensing via satellite. Many of these approaches, although expensive, yield very useful information; others, though inexpensive, produce data of less reliability. Still others are expensive and produce data of questionable utility. An objective for data improvement would combine methods to achieve cost savings while achieving high reliability.

Frequency must relate directly to the data and their intended use. It will always be highly variable. Yet there is need to establish coordinated periods for improved data comparability.

Finally, because data are expensive, priorities must be set on their collection and incorporation into information systems. The capacity to adequately store, retrieve, and manipulate all the data now pouring in from the various satellites does not exist. Selectivity is necessary so that a maximum of useful information can be derived from the wealth of data available.

System Capability: Point, Line, Area Resolution

The adequate study of environmental problems demands a system capable of handling point, line, and area data. An example is the need to coordinate data from a point emission with a stream and the surrounding natural and developed area. Most systems today handle data in only one of these modes. As data-handling improvements are made, this should receive attention.

The setting of water-quality policy for all the lakes of a State, for example, requires a different resolution than that to prepare a program of action to correct the pollution of a specific lake. The task is to retain the ability to aggregate data and yet have comparability at a given scale.

Machine Coordination

This is a less-immediate objective, but one requiring study. If data remain stored in a variety of locations, and if access to information is to be achieved on anything approaching a real-time basis, some linking of machines and agencies would appear to be necessary. The IRIS data system proposed for the State of Illinois would create an interlocked set of computers located at various points throughout the State and a cluster of remote terminals tied to each computer. The whole issue is very complicated, but the ability to achieve coordination will decline as time passes if no action is taken.

Education

Progress in environmental planning and controls requires a massive education program. Far more people know how the land market works than know ecological linkages, perhaps because there is a strong incentive in the market to learn. Information systems of the NARIS, IRIS, IPS type with their direct man/machine interface can be useful tools in problem solving and policy formulation. They also have the potential of being used for programed learning, a potential that bears exploring.

HIGH-PRIORITY RESEARCH PROGRAMS

From the foregoing discussion of data needs of practitioners for planning our physical and social environments, the following research priorities are highlighted by way of summary.

**1. *A Comprehensive Assessment of Data Deficiencies Specifically Applied to Research Needs in Environmental Planning*

Assessment should cover data needs related to various methodologies used in environmental studies, including cost-benefit analysis, mathematical modeling, environmental impact studies, and the measurement of social and environmental goals using indicators and attitudinal surveys. (Current data are too weak to develop adequately the methodologies or models, which in turn are too weak to yield useful estimates even with good data.)

The value of developing a basic data list, similar to the Census, that would be directly applicable to environmental analysis should be explored.

Attention should also be given to problems of data gaps or deficiencies owing to lack of political clout. For example, market-oriented Census data are always included because of the power of these interests. A study is needed of groups who are "underprivileged" in terms of data and what should be done about it.

*2. *A Uniform National System of Environmental Data Including Land Use*

The problem of noncomparable data will become acute with passage of national land-use planning legislation. One part of this research should be a historical review of the Standard Land Use Coding Manual prepared by Housing and Home Finance Agency and Bureau of Public Roads to see where and why it was and was not used.

3. *Geocoding or Geographic Identification in Relation to the Collection and Use of Data*

There is a special need for further study of point versus areal-unit collection and aggregation for different kinds of physical, biological, and socioeconomic information. An evaluation is needed of problems created for historical research when new areas for data aggregation differ from old ones in subjects with large, long-term data field, as for example, Department of Agriculture or Department of the Interior records.

4. *Costs of Data Acquisition, Handling, and Dissemination Under Alternative Approaches Covering Local, Regional, State, and National Levels*

Attention should be given to the problems of overlaps and inefficiencies in data collection and to the lack of effective dissemination to all possible users. The issue of a mid-decade Census on a sample basis should be explored. The study should focus on the cost of continuing to collect old data and, a related matter, the cost imposed by making data obsolete through changing definitions.

Some data can be acquired cheaply but have low reliability, while other reliable data may be very expensive. The study should examine cost-effective combinations of acquisition which achieve reliability objectives at least cost. Another aspect of cost is the evaluation of the marginal cost and benefit for extending the use of data gathered for a specific local problem to, say, the regional or State level.

*5. *An Evaluation of the Present Highly Fragmented Institutional Organization of Data Collection, Handling, and Dissemination, To Determine to What Extent and in What Ways These Functions Should be Retained by or Divorced From Those Agencies, Planners, Researchers, and Others Who Are the Main Users of the Data*

Particular attention should be given to the need to communicate what data are available. The research should focus on means to open direct access to computerized data by nontechnically trained public officials and citizens and to provide technical assistance to local officials, practitioners, and citizens. The emphasis should be on bringing man and machine together in day-to-day operation. An important part of this research should be a historical review of the USAC program. Also, the study should evaluate the recent proposal for establishing an environmental data center in each State.

TWO KEY RECOMMENDATIONS

There are two key recommendations of sufficient concern and importance that they transcend the six research proposals and are separately stated here:

(1) All funding agencies should employ a bonus as part of each research grant to encourage researchers to produce comparable or compatible data.

(2) Access to data by public and citizens cannot be stressed too strongly. There are three aspects of particular concern: (1) making known the data which are available, (2) providing direct man/machine interface without need for highly technical computer language, and (3) developing data needed by all citizens to plead their cases and not limiting data to the concerns of powerful interest groups or strata of population. All funding institutions should consider these three concerns when making research grants.

Chapter 16

INSTITUTIONS FOR LAND-USE PLANNING AND GUIDANCE SYSTEMS

Working Committee on Institutions

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INTRODUCTION

The character of various public and private institutions concerned with land use, and the processes for decision and execution they employ, profoundly influence our physical environments. One of the conference groups probed the problems associated with existing institutions as well as possibilities for the future.

The research programs recommended below deal with existing and proposed arrangements for planning and guiding changes in land uses. The legal and economic tools available to various actors in the land-use drama are also addressed by some of the research proposals. The proposals are concerned with all types of areas: urban, suburban, and rural, those that are already built upon and the areas which may be developed in the future.

LAND-USE AGENTS AND FUNCTIONS

The active agents in dealing with land use include all levels of government (Federal through local) and intergovernmental organizations, private corporations, citizen groups, individuals, and entities that mix public and private elements. Institutions with a single, narrow mission as well as those concerned with the total pattern of growth, change, and development are included.

These institutions perform one or more of the following functions:

1. *Identify the environmental tolerances and standards of land, air, and water for different land uses.*–The Environmental Protection Agency and its State counterparts are examples.

2. *Comprehensive planning.*–City planning agencies and departments for

county, regional, and State planning; an increasing number of private or unofficial planning agencies are also being created.

3. *Land development and redevelopment.*–The multiplicities of investors and builders, public and private, deciding the quantity, location, quality, and timing of development: the homebuilders, industrial-park developers, recreational facility providers, agricultural businesses, and shopping center builders.

4. *The building of infrastructure.*–The Federal Highway Administration, the builders of airports or commuter systems, the providers of water supply, sewage disposal, electric power, natural gas, flood control, irrigation, and all other support systems.

5. *Regulation and control.*–Enforcement of building codes, zoning ordinances, land development and subdivisions.

6. *Finance.*–Investing, lending, or insuring loans for development, including banks, insurance companies, savings and loans, FHA, FNMA, public budgeting agencies, tax administrators, and capital expenditure programers.

7. *Education.*–Extension services, nonprofit associations, universities, Government agencies, and others that provide information (through conferences, reports, research, etc.), advice, and other influences upon development decisions.

8. *Monitoring.*–Agencies providing review and assessment of programs, including the press.

9. *Review and approval or resistance.*–Government agencies and citizen groups exercising power to review, modify, or resist the adoption of land-use decisions.

CRITERIA FOR JUDGING LAND-USE INSTITUTIONS

Each land-use institution, regardless of its specific functions, can be evaluated as to its effectiveness, accountability, and coherence.

1. *Effectiveness.*–How effective is the institution in–
   - (*a*) Reducing inequities between those who may suffer from land-use decisions and those who may benefit?
   - (*b*) Protecting environmentally sensitive areas and resources?
   - (*c*) Improving the quality of life, achieving healthful environments, and reducing costs of public services?

2. *Accountability.*–Many of the current problems of land-use turn on the selection of publics from whom a policy decision is designed. How are Government agencies (or private firms) accountable to the various groups which may have an interest in a particular decision? Further, how may the agency or firm actually involve these groups in the decisionmaking process and what criteria and tools are available with which to resolve conflicts? To whom is the institution ultimately responsible?

For example, how do Government agencies balance the interests of an industrial corporation against those of a residential neighborhood? On a larger scale, what are the rights of a city that shuts off in-migration, taking into consideration the broader State, regional, and national interests? The issue is not merely selecting criteria for decisionmaking, but deciding who (which institution) should make the decision.

Finally, what are the rights of an individual to use his land to his best personal advantage, weighed against questions of overriding public interest? The accessibility of the planning process and its responsiveness to all groups are important related issues.

3. *Coherence.*—How can coherent policies be adopted and pursued when their design and implementation will be carried on by a complex of institutions? Frequently the result is a battle between conflicting institutions, resulting in a standoff with nobody taking the necessary initiative.

PROPOSED RESEARCH

The research proposals are of two types: those concerned with preparing plans and policies and those concerned with their implementation.

* * *

RESEARCH RELATED TO PREPARATION OF PLANS AND POLICIES

**Institutional Responses to Regulation of Migration*

Analysis of decisions that have significantly influenced migration into specific communities (positively or negatively) through a group of case studies, making the following analyses:

(*a*) Means of carrying out the action through growth stimulation policies or through no-growth policies of establishing optimum size, fixed holding capacity, exclusionary zoning, development timing, or preservation-conservation zones.

(*b*) The extent to which actual migration, in or out, is correlated with policies and actions taken to implement the decisions.

(*c*) The effects of the decisions on—

- (1) Neighboring communities
- (2) State interests
- (3) National interests

(*d*) The extent to which local and regional decisions were influenced by Federal or other "outside" action.

(*e*) Community reasons for adoption, and degree of acceptance by community members.

***Responsiveness of Policies to Weak and Strong Social-Interest Groups*

(*a*) An investigation and testing of methods by which "weak" or under-represented social interests (e.g., minorities, aged, housewives, children) may be given a stronger influence on the content and implementation of plans. The study should include methods of organization and design in new communities that will accommodate a wide range of life styles.

(*b*) An analysis of the extent to which land-use decisions are susceptible to *ex parte* influences, such as political campaign contributions. The impact of some social-interest groups is too decisive to the extent that they have succeeded in establishing political-financial-personal obligations on the part of public policymakers. The study should cover the extent to which alternative forms of governmental institutions, new regulation (e.g., of campaign funds), or other alternatives would reduce such influences.

***Public Participation*

Analysis of comparative patterns of public participation in the planning process, with emphasis on early participation in the balancing of competing goals, on combining formal representational procedures with informal representation by groups and individuals, and evaluation of effectiveness. The formal methods of public hearings, for example, have sometimes increased public distrust of officials. Included is an analysis of the need for materials for public understanding of the issues and fact bases involved in planning decisions, including the educational pertinence of early public participation in the planning process.

Problems Stemming From Multilevel Guidance Systems

Analysis of the problems associated with the existing metropolitan system of multilevel land-use guidance that applies one type of guidance to substantially developed areas, another to areas of rapid development, and a different kind of public guidance to the lowest density areas. Attention should be given to incompatibilities among the control systems used in the different kinds of areas and at the different levels of government. Consideration should be given to the impact on private development of the great variety of decisionmaking processes. The development of criteria for determining the best mix and nesting of decisions among different levels of government on complex environmental issues should be studied. (For example, the best mix for decisions on the use of sensitive environments, such as coastlines, estuaries, swamps, and pristine areas, as compared to decisions involved in "fair share" low-cost housing plans.)

Appropriate Scale of Decisionmaking Institutions

An investigation of the effects that aggregated public and private decisionmaking power have on the ability of diverse social interest groups to exert an influence on the land-use planning process. A comparative analysis should be made of institutions of different scale to determine differences in accessibility to affected groups and differences in land-use decisions which result.

Control Procedures Related to the Location of New Communities

Study of State, regional, and local regulatory procedures to govern the location of new communities, particularly as a basis for the design of new and improved procedures. (For example, developing an analog of the floating-zone technique, and its appropriate criteria, for locations chosen by developers and a mapped location technique for publicly chosen sites.)

***Incentives and Penalty Systems to Achieve Public Goals*

(*a*) Study of the future role of the property tax to encourage or discourage land development, using the tax locally or by the State to create incentives and penalties that will implement public plans.

(*b*) An investigation of the use of the special assessment district as a device to finance new kinds of improvements for specially benefited groups as in financing mass-transit stops or other instances of publicly created land value.

(*c*) Analysis of the advantages and disadvantages of incentive zoning to achieve the goals of public plans.

RESEARCH ON LAND REGULATION AND LAND PROPRIETORSHIP

***Evaluation of Public-Private Arrangements in Landownership, Regulation, and Use*

An investigation into the effectiveness for achieving public objectives of major existing and proposed devices, including:

(*a*) The full spectrum of public intervention in the use of land from shortrun and partial interventions (e.g., California's Williamson Act or Ramapo's development timing) through the longer term application of conservation or ecological easements;

(*b*) Fixed zoning and development standards.

(*c*) Public purchase and ownership of land.

(*d*) Fixed-term renewable franchises for a fee.

(*e*) Applications of the regulated public utility concept to new planned communities and to subsidized housing.

(*f*) Urban land banks to finance, acquire, manage, and dispose of land that is not ripe for redevelopment, as in renewal projects, but is to be held for delayed sale; or, for the interim protection of land that is suitable for permanent open space. Also, Federal or State revolving funds for the acquisition and development of land by public or private agencies, as for new community sites or for open space in developing areas.

(*g*) Costs and benefits over the long term of public land acquisition and preparation of infrastructure (including public services) in advance of private development.

(*h*) A composite land development budget that includes all public and private sources to program the sequential investment of public and private funds in roads, utilities, services, and community facilities.

Plan and Project Reviews

An evaluation of the mandatory referral review process within a government and the A-95 intergovernmental process in influencing public and private decisions.

*The Use of Public Land for Urban-Oriented Purposes

Forecasts of demand for different kinds of uses of public lands, as in the recreational use of multiuse areas; improving techniques for the measurement of the costs and benefits in alternative uses of public lands; developing more accurate estimates of public costs and benefits to aid decisions on selling, trading, or permitting a private use on public lands.

Evaluation of Alternative State and Interstate Governmental Structures

A study of changes that may provide for more effective management of metropolitan regional affairs or regionalization of State or interstate services.

*Analysis of the Planned Unit Development (PUD)

A study covering the following issues: Is the PUD effective in improving the form of land development by providing a superior environment esthetically and in terms of other human satisfactions? Does it provide the economic benefits promised for it? Is the amount of latitude provided to local officials in determining whether a project is "consistent with sound planning" in keeping with rules of administrative flexibility? Can present flexibility be encouraged without inviting undue corruption?

*Analysis of New Property Rights Arrangements

Including consideration of–

(*a*) Revision of laws governing the disposition and use of real property to remove handicaps now placed on attempts to share property in new ways (e.g., new family-style arrangements involving alternative to detached single-family dwellings).

(*b*) Application of property rights to megastructures, involving new methods for specifying the rights and responsibilities of individuals and/or group ownership, and covering laws governing the control of communal functions.

Analysis of the Experience of Other Countries in the Organization of Control, Incentive, and Penalty Systems for the Guidance of Settlement Patterns

Chapter 17

ORGANIZATION FOR RESEARCH IN ENVIRONMENTAL AND LAND-USE PLANNING

Working Committee in Research Organization

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INTRODUCTION

Organization of research is concerned with mechanisms which (1) facilitate the flow of knowledge and technical advice from the research community to individuals involved in urban and environmental decisionmaking; (2) translate the practical experiences and real constraints of the decisionmaker into a problem which is researchable; and (3) provide the facilities, personnel, and atmosphere to carry out research. Excellent research has often been accomplished by single individuals or institutions working independently. The complexity and scope of modern land planning problems (and implementation of the conclusions) militates against success for this approach, and suggests the need for an organizational framework to integrate the various groups in the system. For such an integrated research system to operate effectively, numerous and diverse mechanisms are necessary if institutions are to participate without neglecting other primary functions.

It should be stated, at the outset, that lack of high-quality, relevant research is only one of the factors interfering with the capability of practitioners and on-line agencies to handle complex urban and environmental problems. Many of the pressing problems faced each day must receive an immediate response and decisionmakers have to rely on their perceptions of the problem and accumulation of past experience and education to come up with the best solution given the time, budget, and political constraints. It might very well be a mistake to look at research in substantive areas for the solutions to these problems. Improvement of the decisionmaking process depends on such factors as improved practitioner-training programs, new institutional arrangements (and greater flexibility), and "warning systems" which can alert the practitioner to problems before they reach the "most urgent" level. The medium- and long-range problems are the ones which can be better understood (and in some cases, even anticipated) by a concentrated research effort.

In the past, funding sources have regarded the university and research institutions as practically the only source of conceptual and applied research in this area. Unfortunately, most practitioners do not also name these two sources as primary producers of the research they actually employ. It is our contention that funding agencies must broaden their concept of which groups qualify to perform research tasks. At the same time, these funding bodies should reevaluate the number and scope of tasks asked of the university. Ultimately both research and practice are the product of individual effort. The scope and complexity of the problems emphasize the need to attract researchers from a great variety of disciplines. These individuals must be flexible enough to work on problem-oriented, interdisciplinary research teams. It is clear to us that there are individuals who are capable of handling the research and practice functions, but who are hampered by their institutional setting. Most institutions are incapable of dealing easily with multidimensional functions. We suggest that techniques are needed to increase flexibility so that institutions can accommodate the movement of people among them.

The central principle which funding agencies should follow is the willingness to support any individual or entity according to its ability to do quality work within designated research areas. Significant problems, however, are presented by certain types of entities proposing to conduct publicly supported research. For example, while private-sector applicants may be well equipped to perform efficiently and competently in specific research areas, many Government funding agencies have had unsatisfactory experiences with such contract arrangements. For example, at times private firms have used contract funds to cover an undue proportion of institutional overhead. There is always the concern (frequently justified) that the private sector will not fully communicate research findings or that their profit orientation could force them to bias their findings. Thus, public access to methodology, hypotheses, working constraints, etc., should be required if such groups are to be supported.

Other potential applicants for funds, if the scope of eligibility broadens, are the many and diverse citizens' groups, concerned with environmental and land-use problems, as well as research sections of Government agencies. Among the fundamental constraints which have led funding agencies to decline to support such research entities are (1) a bias against intergovernmental transfers which prevents State agencies from receiving Federal research money, and (2) Federal income tax laws which prohibit support for public-interest group research as it approaches advocacy of solutions to public problems.

Implementation of the principle of funding based on ability to do quality work must take into account the above problems. As with the constraints placed on researchers by the current academic promotion system, there are indications that changes are imminent; however, it would be unwise to make recommendations which depend on such change. Thus, when it is not feasible to directly fund certain research projects in particular groups, it becomes the responsibility of the funding agency to make sure (1) that the research needs of citizens and the private sector are adequately reflected in research priorities; (2) that particular projects are undertaken by eligible research entities near enough to the potential consumer (e.g., citizen group) so that the real needs of the group are significantly reflected in the research, and, most important (3) that the research group proves its willingness and demonstrates the methods for widely disseminating its research findings in a form and in terms which are useful and meaningful to the consumers and that such consumers can evaluate and make feedback suggestions to the researcher so that the process becomes iterative.

THE RESEARCH PROCESS

It is important to visualize the research process as a large system where the interdependence of the component institutions/groups is recognized and one does not run the risk of demanding too much from any one institution. While for a particular research project it may be possible to identify a "supplier" and a "consumer," no group is totally supply or consumer oriented. Many individuals and organizations will perform both supply and consumer roles at different periods of time (e.g., Government agencies perform many research tasks and are the consumers of much university based research).

Urban and environmental problems, by their very nature, are such that it is difficult for one to remain detached, or to avoid forming opinions regarding the urgency of some over others. Even the university-based individual who primarily does conceptual research is not totally isolated from many of the real problems under study as he functions within the urban/natural environment and daily experiences its failures and difficulties.

Organizations concerned with this research process include the political sector (legislative and executive branches of all governmental levels), government operating agencies (Federal, State, regional, and local), the private sector (including financial institutions, commercial enterprises, individual developers, and land development firms), professional associations, foundations, consultant firms, and citizens' groups.

While the private sector may not be in the best position to do public-oriented research, it is important for groups such as land developers to have high-quality information so their actions will have great social and environmental impact. Such research might provide them with alternative courses of action which they would not otherwise consider (e.g., programs which demonstrate environmentally sound projects within reasonable cost constraints). Consultant firms are another, frequently overlooked, group performing research tasks for public agencies, while at the same time relying on data, primary research, and methodology from universities and elsewhere.

Citizens, both individually and in groups, influence the research process at all points. It is the perception of citizen concerns and problems by politicians (and practitioners) which defines public priorities and filters down into research needs. In the broadest view it is citizens who are the ultimate consumers of all research solutions. In organized groups, they sometimes do their own research for a particular advocacy viewpoint (e.g., Nader). In other cases they require information on which to base their reactions and input in relation to specific legislative and policy issues.

While it is difficult directly to fund such groups, it is essential that they receive high-quality research, perhaps through funding of programs, institutes, or new arrangements whose primary tasks include supplying voter/citizen groups with information on current issues.

TYPES OF RESEARCH ISSUES

There are four major types of issues about which land-use/environmental research is concerned. Differentiation of researchable items by such categories is helpful because the research approach and dissemination techniques vary according to both substantive areas and relevant publics.

1. *Issues of public concern.*—This category involves analysis of major societal problems, incorporating those of immediate (or even crisis) nature as well as long-term problems. To date, two kinds of issues have received insufficient attention—immediate problems and very-long-range considerations.

2. *Analysis of proposed legislation and policy and program alternatives to achieve established objectives.*—This policy area includes advice to members of legislatures and agencies on the effectiveness of their programs for accomplishment of goals. This research frequently gets postponed—often until after the legislation gets enacted.

3. *Evaluation of operation strategies and ongoing programs* (e.g., The Urban Institute's analysis of FHA 235 and 236 housing programs).—This type of work must somehow be presented so that the suggestions and conclusions can be immediately integrated into the ongoing programs.

4. *Public counseling and advocacy programs.*—These programs include voter information in the case of local and statewide referendums and initiatives, as well as other citizen information programs. It is in this area where special attention should be paid to the style in which the findings are presented. In California, voters have been confronted with massive billboard and media advertising campaigns advising them how to vote on statewide propositions concerning environmental issues. If "objective" or, at the least, "balanced" information was presented, it would have to be in a form which can compete with the advertising in order to have any impact. The major obstacle to such funding is the Internal Revenue Code.

Finally, there are some questions which relate to both the involved groups and the substantive research items. The answers to these questions will help define the form the research task and solution will assume:

(1) Who pays for the research and dissemination?
(2) Is the form of funding appropriate to the problem to be addressed (e.g., program versus project funding)?
(3) Can a particular client group or groups be identified?
(4) How are they involved in research organization and how will they be involved in dissemination?
(5) What is the time horizon and how does it relate to the institutional demands of the researcher and practitioner?
(6) What questions are being asked by the practitioners and is there any information which is not being requested but which should be supplied?

RECOMMENDATIONS

1. *The central principle which funding agencies should follow is the willingness to support any individual or entity according to its ability to do quality work within designated research areas. Standards should not depend on established institutional affiliations.*

Essentially, the objective in organizing or employing research institutions is to assure a plurality of institutions (or arrangements) for a plurality of users. In evaluating any research proposal, funding agencies should consider both supply and demand factors, asking about the user groups and the extent of real need for the research, its basis in general theory, the fitness of the applicant to develop the project, and the adequacy of dissemination techniques the applicant proposes to reach a range of interested potential users.

Funding sources should be open to proposals from research components in government agencies. Some promising experiments to provide government officials with exposure to intensive, high-level research have involved seminar retreats (e.g., The Eagleton Institute, Hudson Institute). Generally, proposals for support to fill these needs should be judged according to the following criteria:

- Supported activities should not be too closely identified with day-to-day conduct of agency affairs (speechwriting, development of testimony, justification of decisions).
- Part of the mission of the supported people should include awareness of developments in applied research.
- The entity should offer a means for outside researchers and students from universities and other institutions to participate in the more practical research efforts of the Government agency.
- Capability for dissemination to citizen, public, and private interest groups should be required of Government applicants.

- Where funding goes to a local agency, it should be clearly demonstrated that the research processes and methodology will be useful beyond the immediate local area; the means to make it widely available should be set out.

2. *Ultimately both research and practice are the products of individual effort. The scope and complexity of the problems emphasize the need to attract researchers from a great variety of disciplines.*

Problems of recruiting high-level talent for applied research arise partly as a consequence of academic values (emphasis on individual products rather than team research, rewards for publication in accepted journals rather than report writing or other forms of expression, greater regard for theoretical rather than practical problem solving). These values cannot be easily altered by funding institutions; nor should they be. The recruitment problem, however, can be addressed by supporting:

(1) Creation of new research coalitions (or research contexts) through experimental approaches. An example is the experimental effort being tested in the newly emerging field of urban ecosystems. Readiness to support significant interdisciplinary efforts of this type should be encouraged.
(2) Professional fields already involved in research on the applied aspects of land-use planning, including joint academic programs such as those offering degrees in law and planning, natural resources, and economics, etc.
(3) Scholars in the various disciplines capable of providing knowledge helpful to environmental planning problems.
(4) Practitioners, with appropriate backgrounds, interested and trained to conduct research.
(5) Persons in public interest groups who work to convey their point of view directly without relying upon researcher intermediaries. Citizen group experience and insights are worth having in whatever form possible and their work should not be held to academic standards of presentation, organization, and language lest their insights and point of view be obscured.

Often, while university and other researchers are ready to undertake work on problems of public urgency, the way in which they formulate questions and design research projects is not entirely relevant to the public need. Such researchers should be encouraged to allow for greater participation on the part of individuals more directly involved in dealing with such issues, and should expose their programs for outside critique.

3. *Importance of conceptual research*

Funding agencies should recognize that basic or conceptual research is the foundation upon which other research is constructed. Therefore, pure research should be supported directly and indirectly. Applicants in applied research should be required to establish their awareness of basic studies and conceptual developments, and should be required to communicate periodically (through conferences and other methods of information exchange) with people and institutions conducting conceptual research. Applications for assistance in applied research should be screened by knowledgeable scientists (as well as persons with applied experience) and the end product should likewise be evaluated by these researchers. These procedures will enhance quality control and in addition will assure a degree of exchange and feedback between basic and applied researchers.

4. *When it is not feasible directly to fund certain research projects in particular groups, it becomes the responsibility of the funding agency to make sure that . . . particular projects are undertaken by eligible research entities near enough to the potential consumer so that the real needs of the groups are significantly reflected in the research.*

Nonuniversity research institutions and centers—e.g., Rand, Urban Institute, and Resources for the Future, Inc., as well as national laboratories, have interest and capabilities that should be exploited and strengthened. In many cases they compete with universities (and other organizations) for personnel. They offer the researcher an atmosphere similar to the "scientific community" without many of the pressures experienced with the university (teaching, especially). Such institutes have the resources to get the expertise needed for particular problems without many of the time, money, and political constraints of the private sector.

The inherent capabilities of these entities should be recognized, but their deficiencies in dissemination of information should be addressed and remedied. As a condition of support they may be asked to develop programs for making quality information regularly available to citizen groups, the private sector and Government agencies.

Research institutions should include private consultants in their conferences, workshops, and other information exchange forums with an eye toward drawing on their experience as well as offering them research information. Similarly, other private sector participants, such as land developers and builders, should be included and research which responds directly to their needs supported. To better assure quality control, however, a research entity rather than a developer directly should conduct work on problems of concern to the private sector.

Funding agencies should support research responsive to citizen group needs. Long-term and short-term efforts should be assisted. However, the principle of funding a research entity rather than the citizen group directly is as applicable in this instance as in the case of the private-sector groups. Here again this technique will assure quality control in an activity which citizen groups are rarely equipped to perform for themselves. Dissemination of results is of particular concern with citizen groups and a process for popularizing research conclusions should be required.

An institutional deficiency to be addressed is the limited geographic focus of much research. Problems of urbanization which extend beyond a city or metropolitan area throughout an "urban field" require attention. Research institutions with statewide perspectives are needed increasingly, for States are uniquely equipped legally to affect land use. Enactment of legislation like the proposed National Land Use Policy Act will require more extensive State action to deal with problems of physical development and planning, and call forth more sophisticated applied research activities.

5. *There are individuals who are capable of handling the research and practice functions, but . . . are hampered by their institutional setting. Techniques are needed to increase flexibility so that institutions can accommodate the movement of people between them.*

Dissemination programs should be supported by incentive and bonus grants which provide funds to support various kinds of exchange, including, for example, interpersonal exchange which would allow people in applied research positions to serve for a period (at full salary) with Government, public interest, or private-sector groups.

Practitioners serving temporarily with research institutions will often have special needs in learning to use research facilities and materials, in defining and developing grant applications for their problems, and in relating to academic researchers. These needs should be supported by bonus incentives to research institutions which indicate a willingness to develop this type of exchange program.

Likewise, applied research institutions should be encouraged to employ individuals from public agencies and nongovernmental groups. The professional and academic needs of researchers on temporary assignment with Government should be recognized, possibly by allowing additional periods after the term of service to publish his results and otherwise to extract research issues from his practical experiences in problem solving.

6. *It becomes the responsibility of the funding agency to make sure that the research group proves its willingness and demonstrates the methods for widely disseminating its research findings in a form and in terms which are useful and meaningful to the consumers. . . .*

Funding agencies should ask applicants in applied research if they would be willing to engage in a sustained process of dissemination of information and technical assistance to citizens, the private sector, and other practitioners.

Ad hoc groups should be encouraged to improve their techniques for dissemination of results. They should explore graphic and visually appealing forms, and should exploit the film and television media. Without such effort, discrete, short-term research efforts may be filed and quickly forgotten.

Consultants have extensive contacts with Government agency people and with citizens, and are an important resource for disseminating information. Funding agencies should support activities which have the effect of raising the quality of consultant work—by providing them with better data, research conclusions, and regular sources of information.

7. *Supplying research needs to the political sector*

The political sector—Federal, State, and local officeholders—have special needs for research that are met somewhat by the Library of Congress at the Federal level, but are inadequately served at lower levels of Government. Proposals to strengthen research facilities and services capable of providing best-practice advice on a short-term basis to legislators should be supported. Supported facilities should be required to have close linkages to applied research institutions. Universities may well not be interested in filling this sort of research need. A number of institutional arrangements are conceivable (e.g., scientific advisers, technical advisory committees, urban and regional centers) and various experimental efforts designed to deal with policy and program issues for the unit of Government should be supported.

The increasing resistance of legislatures and political figures to university faculty members giving time to practical problems should be recognized, and an effort made to overcome it. Partially, this resistance reflects a concern about supporting political activism and lobbying in behalf of change perceived by some as radical. But it also may reflect a concern about the failure to receive from academics full value in terms of time given to teaching and research to the State employer, and a concern about academics supplementing their full salaries with outside paid work. Consultant services to legislators themselves should be encouraged of willing researchers in universities or elsewhere, and support for such activities should be provided.

8. *Ad hoc research efforts*

The value of ad hoc research efforts should be recognized. The ad hoc group, by its nature, is a research entity formed around a specific problem. It can often mobilize a concentrated, high-level effort on an immediate, action-oriented mission. National commissions, for example, can perform important functions, but they should be encouraged to develop follow-through capacity by association with ongoing research entities. This technique will update and reassess the initial product and assure that the commission contribution is not a one-shot affair. Special task-force efforts should also be supported if they are broadly focused and display some potential for a "multiplier" effect. Student ad hoc research efforts sometimes produce high-value products at low cost, especially when incorporated into organizations addressing practical needs.

Such ad hoc groups can perform discrete research assignments and make policy recommendations on matters such as open space or housing. They can clarify confusing public questions (e.g., the California Environment Initiative) with a candor not possible in Government. Without such efforts, complex public issues may be distorted by advertisers and interest groups.

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